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Monterey, California: Naval Postgraduate School

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# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



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### THESIS

**SOCIOECONOMIC STATUS AND PERFORMANCE  
IN THE US ARMY AND US MARINE CORPS**

by

Stefan J. Booth  
and  
Kevin M. Schmiegel  
March 1998

Thesis Co-Advisors:

Michael D. Cook  
Mark J. Eitelberg

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## FOREWORD

This thesis is part of a research project conducted at the Naval Postgraduate School (NPS) in 1997-1998. The project—"Study of Socioeconomic Status and Personnel Performance in the Military"—was supported by the Office of the Secretary of Defense and undertaken by a team of researchers that included Dr. Mark J. Eitelberg, Dr. Michael D. Cook, Commander Carl R. Heldreth, USN, Lieutenant Rebecca L. Harper, USN, and the authors of this thesis. The background work, literature review, database development, and statistical analyses for the NPS study were thus accomplished as a team effort. For ease of exposition, team members decided to prepare two separate master's theses: one that focused on the Navy and Air Force; and another that looked exclusively at the Army and Marine Corps. It should be noted that, because of the nature of the research project and combined contributions of team members, both theses draw heavily from the same background information and general findings. Consequently, major portions of this thesis are duplicated in the other work: Carl R. Heldreth and Rebecca L. Harper, *Socioeconomic Status and Performance in the US Navy and US Air Force*, Master's Thesis, Naval Postgraduate School, Monterey, California, March 1998. Additionally, selected results of the two theses will be incorporated in a separate study by Eitelberg and Cook, scheduled for publication as an NPS technical report in 1998.

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**SOCIOECONOMIC STATUS AND PERFORMANCE  
IN THE US ARMY AND US MARINE CORPS**

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**MASTER OF SCIENCE IN MANAGEMENT**

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## ABSTRACT

Policy makers concerned about population representation in America's armed forces have frequently referred to the "unfair burden" of military service borne by young people from lower social or economic backgrounds. The purpose of this study was to examine socioeconomic status (SES) of recruits in the Army and Marine Corps and to analyze the relationship between a recruit's SES background and his or her performance in the military over time. Data for this study were obtained from three sources: the Department of Defense Survey of Recruit Socioeconomic Backgrounds (SES survey), Military Entrance Processing Command enlisted cohort files, and personnel data files provided by the Army and Marine Corps. After merging these data files, the SES survey respondents were tracked longitudinally, and several analyses were undertaken to assess the relationship between SES and performance in the military. The results of this research show that recruits in both services come from slightly lower SES backgrounds than do youths in the general population; and, most of this difference can be explained by the fact that soldiers and Marines are consistently underrepresented in the highest measures or correlates of SES and overrepresented in the lowest ones. Additionally, it was found that, while SES is not a strong predictor of first-term enlisted attrition in either service, it does explain differences in recruits' performance on-the-job in the Marine Corps. Further research is recommended, especially that which incorporates supervisors' ratings of military performance.





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## LIST OF ACRONYMS

AFQT	Armed Forces Qualification Test
AVF	All-Volunteer Force
CPS	Current Population Survey
DMDC	Defense Manpower Data Center
DoA	Department of the Army
DoD	Department of Defense
HMF	Headquarters Master File
HQMC	Headquarters Marine Corps
ISC	Interservice Separation Codes
Logit	Logistic regression analysis
MEPCOM	Military Entrance Processing Command
MCRD	Marine Corps Recruit Depot
MOS	Military Occupational Speciality
MSEI	Male Socioeconomic Index
NPS	Non-prior service
OLS	Ordinary Least Squares
OSD	Office of the Secretary of Defense
PFT	Physical Fitness Test
POPREP	Population Representation in the Military Services
SAS	Statistical Analysis System

SEI	Socioeconomic Index
SES	Socioeconomic Status
SES Survey	Department of Defense Survey of Recruit Socioeconomic Backgrounds
SQT	Skills Qualification Test
SSN	Social Security Number
TSEI	Total Socioeconomic Index
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
VEF	Verification Extract File

E-1 through E-3 are junior enlistees

E-4 through E-6 are mid-grade enlistees

E-7 through E-9 are senior enlistees

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## I. INTRODUCTION

"We have in the service the scum of the earth as common soldiers," observed Lord Wellesley, Duke of Wellington, in 1813. Similar descriptions have been used to characterize U. S. enlisted forces both before and after the All-Volunteer Force (AVF) was introduced in 1973. During its first two centuries of existence, America, like most other nations, depended heavily on the poor, uneducated, and underprivileged to serve as enlistees. The soldiers of America's first army were considered, by most U. S. officers, to be the "dregs of all the countries" from "the same class of men who composed the common soldiers of Europe."<sup>1</sup>

In the 18<sup>th</sup> and 19<sup>th</sup> centuries, the burdensome life of the rank-and-file was typically endured by America's less valued citizens; and virtually anyone willing to withstand the hardships of service life was accepted for duty. While the sons of poor farmers, laborers, and immigrants were forced to join out of economic necessity, others who were bright or skilled enough to find civilian employment typically ignored the call to serve as enlistees. In times of peace, no one seemed to question the harsh conditions of military service. The issue of socioeconomic representation in the military, however, received significantly more attention during times of war, when men of poor backgrounds were drafted and died on the battlefield in larger proportions than the more privileged or occupationally skilled.

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<sup>1</sup>From Mark J. Eitelberg, *Manpower for Military Occupations* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management and Personnel], 1988), p. 4.



Throughout America's history, its wellborn sons have found ways to "dodge" the country's draft laws, which often provided them with the necessary escapes and exclusions to forge ahead with their education and careers. During the Revolutionary and Civil Wars, for example, compulsory service was often avoided by the "rich," who could hire "poor" substitutes to fight on their behalf. The draft system implemented during World War I was designed to shelter the educated and skilled as it categorized and conscripted Americans according to their "value to society." And statistics from the battlefields of Vietnam further supported arguments that America's lower social classes were overrepresented in times of war.

Policy makers concerned about the disproportionate use of recruits from lower socioeconomic backgrounds to man U. S. forces have frequently referred to the "unfair burden" of military service borne by these citizens. When the post-World War II draft officially ended in 1973, concerns about the social composition of the force not only continued, but intensified. In addition to several studies that evaluated the socioeconomic status (SES) of recruits in the post-draft military, the Department of Defense (DoD) has paid particular attention to the demographic composition of its service members. Continuing interest in identifying the SES of military recruits, and tracking changes in SES representation, led to development of the DoD Survey of Recruit Socioeconomic Backgrounds (commonly referred to as the "SES survey") in March of 1989. The general results of the survey have been presented since 1991 in DoD's annual report on *Population Representation in the Military Services* (POPREP).

Another area of particular interest to military manpower officials involves the possible relationship between a recruit's SES background and his or her performance in the military. For example, differences in SES may help to explain the high rates of attrition among first-term enlisted personnel as well as several performance measures that determine promotion in each of the services. In light of these interests, a special database was created by the authors of this study. The SES survey results were linked with historical data files for each cohort of new recruits entering the Army and Marine Corps during fiscal years 1989 through 1995, making it possible to track the composition of enlisted forces and the service careers of persons who participated in the survey.

The purpose of this thesis is twofold: to examine the SES background characteristics of recruits in the Army and Marine Corps in comparison with the general population; and, to analyze the relationship between a recruit's SES background and his or her performance in the military over time. This study follows several steps to accomplish these objectives. In Chapter II, the authors provide a detailed background and historical perspective of socioeconomic representation in the armed forces. The background discussion also includes a review of several studies that are related to the topics of SES and performance in the military. Chapter III explains how the database was created for this study as well as the methodology used to determine the relationship between SES and performance in the Army and Marine Corps. The results of the cross tabulation analysis and linear and logit multivariate models are provided in Chapter IV. And, finally, in Chapter V, the authors draw several conclusions based on these results and offer recommendations for future research using this study's database.



## II. BACKGROUND

### A. INTRODUCTION

In the military's ongoing efforts to recruit and retain the "right kinds of people," manpower policy makers have struggled not only to regulate the quantity and quality of new soldiers, sailors, airmen, and Marines but to monitor the background characteristics of enlisted forces.<sup>2</sup> Although socioeconomic representation in the military received significant attention with the introduction of the AVF in 1973, imbalances in the social composition of U. S. forces have existed since our colonial fathers "stood up" an army at Concord in 1775. A review of the history of conscription and volunteerism in the United States reveals striking similarities between the socioeconomic composition of the force under the draft and the AVF.<sup>3</sup> Similarly, military manpower policies in both eras have been shelved, altered, and implemented based on considerations for socioeconomic representation.

One of the more persistent concerns about the AVF has been its presumed inability to attract a representative cross section of the American population and the related issue of social equity or "fairness."<sup>4</sup> Representativeness in the armed forces has been pursued for several reasons. Critics of the AVF argued that a "professional" army

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<sup>2</sup> Sue E. Berryman, "Images and Realities: The Social Composition of Nineteenth and Twentieth Century Enlisted Forces," in D. R. Segal and H. W. Sinaiko, eds., *Life in the Rank and File* (McLean, VA: Pergamon Brassey's International Defense Publishers, 1986), p. 10.

<sup>3</sup> Richard V. L. Cooper, *Military Manpower and the All-Volunteer Force* (Santa Monica, CA: RAND Corporation, 1977), p. 206.

<sup>4</sup> Martin Binkin, *America's Volunteer Military: Progress and Prospects* (Washington, DC: The Brookings Institution, 1984), p. 20.

would not only create gaps between the military and the rest of society, but that military effectiveness would suffer as a result of the AVF's failure to recruit youth from middle-to upper-class backgrounds. Yet, the estimated effects of the AVF on military isolationism and readiness were highly subjective and difficult to measure. Several politicians, therefore, relied on the issue of "fairness" to discredit the concept of volunteerism.

History--two hundred years of the disproportionate and inequitable treatment of our less fortunate citizens--fueled arguments against the AVF. With statistics from past wars, government officials possessed the historical data that they needed to voice their positions. In the 1980s, social equity served as the platform for senators and representatives who called the AVF a "glaring civil wrong," and echoed concerns, first expressed during the Civil War, with the familiar words: "it is the poor of the country whose blood is shed."<sup>5</sup> Social composition became a debate about the "benefits" and "burdens" of military service borne by the lower classes during times of peace and war, respectively.

The definition of who constitutes the "right" young recruit has changed in concert with the growing technological demands of the military. Nevertheless, the basic need for good manpower and concerns about the demographic composition of our fighting forces have remained constant over time and will continue throughout the unforeseeable future.<sup>6</sup>

Recent controversy over possible subgroup differences in the performance of military-specific tasks has focused attention on the possibility that performance differences may

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<sup>5</sup> Senator Ernest F Hollings and Representative Paul Simon, quoted in Binkin, *America's Volunteer Military: Progress and Prospects*, pp. 20-21.

<sup>6</sup> Eitelberg, *Manpower for Military Occupations*, p. 3.

be attributed to SES, not simply to membership in a specific demographic category.

When choosing the "right" force, policy makers must carefully balance issues of social representation and concerns for inequity with differences in individual and unit performance and the ability of each service to accomplish its assigned mission.

Historically, and most likely in response to recurring concerns about social equity, manpower analysts have used SES to compare the composition of enlisted forces with the rest of American society. Yet, the effect of SES on military performance has never been explicitly measured. If history repeats itself, we can expect that concerns about "social representation" will resurface in debates about the AVF--ultimately affecting the policies used when choosing the "right" people.<sup>7</sup> The question is: In assessing what is "right" in the future, should manpower policy makers consider the relationship between SES and performance or strictly concentrate on mirroring a broad cross-section of American society to achieve fairness or representativeness?

## **B. LITERATURE REVIEW**

A review of the literature that addresses socioeconomic status in the military reveals some noteworthy trends. Although several authors cite the term "socioeconomic status" in their studies, "there is no general consensus regarding how to define and measure this construct."<sup>8</sup> Conversely, most authors agree that a detailed historical perspective is necessary to support a systematic analysis and conclusions about social

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<sup>7</sup> From Berryman in *Life in the Rank and File*, p. 10.

<sup>8</sup> Department of Defense, *Population Representation in the Military Services, Fiscal Year 1995* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management and Personnel], 1996), p. 7-2.

representation in the military before and after creation of the AVF. Several authors--including Cooper (1977), Fredland and Little (1982), and Fernandez (1989)--have found that differences between the social composition of the enlisted force and the general population are relatively modest and have changed little since the inception of the AVF. No studies, however, could be found that examined the effect of SES on performance in the military.

Previous literature provides several significant "lessons learned" regarding the study of SES in the military. Although SES is generally defined as an indicator of economic and social position,<sup>9</sup> the definition used in this study largely depends on the measures and back-ground characteristics contained in the SES survey. Second, a study of SES in the military requires an understanding of its history before and after DoD implemented the AVF. Third, the composition of enlisted accessions under both the draft and volunteer systems resembles the population as a whole with a slightly lower average SES value due to underrepresentation of the top quartile of SES among military members.<sup>10</sup> Finally, by examining the effects of SES on performance in the military's ground forces, this study explores an aspect of military manpower policy not previously mentioned in debates about social composition and the AVF.

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<sup>9</sup> Cathy A. Stawarski and David Boesel, *Representation in the Military: Socioeconomic Status* (Alexandria, VA: Human Resources Research Organization, 1988), p. 8.

<sup>10</sup> See *Population Representation in the Military Services*, FY 1991-1995.

## 1. Defining Socioeconomic Status

Within the general populace, socioeconomic status is most commonly referred to and understood as social class. SES is typically used as a "shorthand expression for variables such as education, occupation, income, employment status, family background, and tangible possessions that characterize an individual's capacity to create or consume goods that are valued in our society."<sup>11</sup> There are various ways to measure SES; research suggests that occupation best explains socioeconomic position and that additional variables, such as education and income, can significantly increase explained variance in social class. Although education, occupation, and income are consistently used to assess SES, most studies define and measure this construct differently because of the "convenience and availability" of certain measures that may explain unique dimensions of SES and represent the construct more completely.<sup>12</sup>

One way of measuring SES is the socioeconomic index (SEI), which attempts to quantify socioeconomic status based on parental occupation alone. Stevens and Cho devised a summary statistic for SES in their 1985 study, *Socioeconomic Indices and the New 1980 Census Occupational Classification Scheme*. They used predicted prestige scores to estimate annual income and education levels within occupations.<sup>13</sup> The Stevens and Cho study was based on the work of Duncan (1961), who attempted to estimate

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<sup>11</sup> Robert M. Hauser and John R. Warren, *Socioeconomic Indexes for Occupations: A Review, Update and Critique* (Madison WI: Center for Demography and Ecology, June 1996), p. 3.

<sup>12</sup> Department of Defense, *Population Representation in the Military Services, FY 1995*, p. 7-3.

<sup>13</sup> Gillian Stevens and Joo Hyun Cho, "Socioeconomic Indices and the New 1980 Census Occupational Classification Scheme," *Social Science Research*, 14 (1985), pp. 142-168.



socioeconomic scores in an effort to counteract the lack of prestige scores for most occupational titles.<sup>14</sup> Duncan estimated SEI scores by regressing prestige scores from a 1947 study on age-standardized occupational levels of earnings and education for a limited set of occupations obtained from 1950 census data. He then applied the weights for earnings and education levels to all other occupations to obtain predicted prestige scores.

While Stevens and Cho found that SEI scores for 1980 occupational titles appeared to describe socioeconomic distances between occupations in a manner consistent with Duncan's findings,<sup>15</sup> the more recent work of Hauser and Warren (1996) argues that prestige-validated socioeconomic indices are of limited value, because they give too much weight to occupational earnings. Differences in definitions of variables, functional form, and treatment of outliers result in significant changes in SEI in their study. Hauser and Warren found that levels of occupational education alone, as opposed to weighted combinations of educational levels and earnings, better defined the main dimension of occupational persistence across and within generations and provided a more useful estimation procedure to index occupations.<sup>16</sup> Despite their differences, the development of an SEI in all three studies provides future researchers with important frameworks to better measure occupation, the best single indicator of SES.

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<sup>14</sup> Otis Dudley Duncan, *A Socioeconomic Index for All Occupations*, in A. J. Reiss, Jr., (Ed.), *Occupations and Social Status* (New York, NY: Free Press, 1981), pp. 139-161.

<sup>15</sup> See Stevens and Cho, pp. 167-168.

<sup>16</sup> See Hauser and Warren, pp. 2, 68-69.

## **2. Historical Perspective**

Socioeconomic status of enlisted accessions in the military became a controversial social and political issue with the introduction of the AVF in 1973. Although a primary goal of the AVF was to correct the injustices of conscription borne by the lower classes of American society, opponents of the volunteer system often referred to issues of social misrepresentation when arguing against the removal of the draft. Fears that the poor and blacks would bear an "unfair" burden in the nation's defense--and that a volunteer military would distance itself from the rest of society as an "employer of last resort"--were unfounded in light of the draft's sordid history and its consistent failure to represent the general population.<sup>17</sup>

Before we determine whether or not social class can be linked to differences in military performance, we should first consider the make-up of our enlisted forces in a larger historical context. As history and traditions continue to serve both proponents and opponents of an all-volunteer military, we should examine the background characteristics of the common soldier in armed forces that have enjoyed success under systems of nationwide conscription and varying degrees of volunteerism.

### ***a. The Colonial Era***

With the birth of the "citizen militia" in 1775, the upper class relinquished the noble privilege of military service, and the right and obligation of citizen participation in armies became the future standard of American military tradition. Although every able-bodied man was considered part of the colonies' "defense establishment" prior to the

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<sup>17</sup> Cooper, p. 204.

War of Independence, consolidation into a continental army became necessary with the Revolution.<sup>18</sup> The harsh conditions and hardships associated with service life did not attract the well-educated, skilled, or those with a propensity to marry and raise children; the enlisted men of the colonial era were poor--penniless drifters with no property or family ties and "a bad reputation with the general public."<sup>19</sup> The colonial forces of the Revolutionary War filled its rank and file with men who possessed the minimum requirements of an "able body." A continental army with no concerns for the morale and welfare of its troops was forced to accept almost any man who could walk, talk, see, and hear, and would continue to do so for the next 50 years under conditions of military service that could be characterized as "criminally negligent."<sup>20</sup>

Implementation of a standing Federal army following the Revolution received some consideration but never materialized. State militias continued to provide the necessary military manpower through the end of the 18<sup>th</sup> century and American expansionist efforts in the War of 1812. Consistent with opposition to a federal system of conscription and the infeasibility of a career enlisted force, no great effort was made to improve the burdensome life of enlistees. Enlisted volunteers in times of peace before the Civil War "comprised a rather sorry lot, recruited from the dregs of American society

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<sup>18</sup> Ibid., p. 47.

<sup>19</sup> Joseph Warren, "The Dangers of Standing Armies," *The Military in America*, pp. 21-44, as cited in Eitelberg, *Manpower for Military Occupations*, p. 4.

<sup>20</sup> Hayes, *Evolution of Armed Forces Enlisted Personnel Management Policies: Executive Summary*, p. 61 as cited in Eitelberg, *Manpower for Military Occupations*, p. 4.

and the scum of the population of the older states.”<sup>21</sup> Individuals with the skills and talents to earn a competitive wage as laborers and mechanics avoided peacetime military service, leaving those “infected with some moral infirmity” to pursue the menial, uninspiring existence of a recruit.<sup>22</sup>

**b.      *The Civil War***

Negative images of the “dregs” and “scum” who endured the “physically arduous, dirty and thankless job” of military service are part of the history and tradition of the American military during both eras of volunteerism and the draft. Less fortunate citizens would bear an unfair burden of the hardships of enlisted service life under both systems, because individuals from higher social classes chose to ignore voluntary service, joined the officer corps, or purchased substitutes to avoid conscription. While volunteerism resulted in “economic conscription” of the poor and underprivileged, draft laws typically provided escapes and exclusions for the more privileged, educated, and occupationally skilled, as evidenced in the country’s first draft laws, which effectively shackled society’s lower classes.

Under systems of conscription implemented in the South and North during the Civil War, the burden of war was disproportionately borne by individuals who had not “enjoyed a fair share of society’s benefits.”<sup>23</sup> For example, the Union’s Enrollment

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<sup>21</sup> Prucha (1953) as quoted in Sue E. Berryman, *Who Serves? The Persistent Myth of the Underclass Army* (Boulder, CO: Westview Press, 1988), p. 21.

<sup>22</sup> *Ibid.*, p. 22.

<sup>23</sup> Martin Binkin, *Who Will Fight the Next War? The Changing Face of the American Military* (Washington, DC: The Brookings Institution, 1993), p. 61.

Act of 1863 allowed the rich to pay others to serve for them, or, worse yet, pay the government \$300 to buy a substitute on their behalf. "Rich man's money, poor man's blood" became a popular complaint of the masses as the Civil War dragged on, and the battlefields were no longer stained with the blood of "men who had given up good situations to enlist." From the Revolution to the Civil War, the poor and unskilled endured "starvation, rags, dirt and vermin," and ultimately gave their lives in alarmingly unfair proportions. Meanwhile, wellborn citizens, protected by their roles and status in society, were able to elude military service in the enlisted forces using their socioeconomic advantage.<sup>24</sup>

*c. The World Wars*

Little changed with the draft system established during the First World War, as the government classified all male registrants according to their "value" to the civilian sector. Conscription became the basis for all enlisted accessions in 1917, and the working class again shouldered an unrepresentative portion of the warfighting effort.<sup>25</sup> Registrants were ranked and inducted according to their value to society, generally measured by income, educational attainment, skill level, and marital/family status, leading to an overrepresentation of the poor and black on the battlefield. One in eight draftees was black at this time, and one in six was an immigrant. Individuals deemed most valuable to the civilian sector were categorized as Class V, while the least-valued individuals were drafted first as Class I registrants. It is no wonder that the average

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<sup>24</sup> This paragraph contains several excerpts from Eitelberg, *Manpower for Military Occupations*, p. 7.

<sup>25</sup> Cooper, p. 51.

World War I draftee was an uneducated, unmarried man in his early twenties who was more likely to be illiterate, unskilled, and poorer than the average man of the same age in the civilian sector.<sup>26</sup>

The military draft would be used to fill the ranks of the U. S. Army for the next three episodes of war from 1940 to 1973. Except for an 18-month lapse just after World War II, conscription was necessary to enforce foreign policy and ensure preparedness. Although American society had accepted the obligation of its citizens to serve as World War II came to an end, opposition to the draft would continue to reappear over the next three decades. During the world's largest war, 16 million Americans served in the armed forces, and escapes and exclusions for the skilled and educated became the exception rather than the rule. In fact, a study of SES and educational attainment of veterans and non-veterans from World War II to 1973 found that veterans prior to Vietnam came from families with higher SES backgrounds than non-veterans. However, the data may have represented upwardly biased estimates of the characteristics of U. S. enlisted forces in World War II and the Korean War, because officers were included as veterans.<sup>27</sup> In the wake of massive mobilization and the "fair" representation of enlisted forces during the Second World War, policy makers began to reexamine the usefulness of conscription. Proponents of volunteerism raised issues of preparedness and questioned the cost-saving methods of "standing up an Army for the next war."<sup>28</sup>

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<sup>26</sup> Berryman in *Life and the Rank and File*, p. 21.

<sup>27</sup> Berryman, *Who Serves? The Persistent Myth of the Underclass Army*, p. 39.

<sup>28</sup> Cooper, p. 49.

Draft systems imposed on the American population from the Revolution through the First World War heavily overrepresented the poor. Higher classes of men either benefited from draft boards, which inducted “less-valued” citizens, or they avoided service by pulling strings and hiring substitutes. Although discrimination was less overt with the introduction of peacetime conscription following World War II, the rich could still find ways to avoid service if they had the will to pursue self-serving goals. College deferments and draft-exempt jobs resulted in a system of conscription that continued to exploit the poor, as less fortunate citizens were called upon to serve in disproportionately large numbers and were paid far less than the market-clearing wage.<sup>29</sup>

*d. The Vietnam Era*

Debates about the social representativeness of the military resurfaced during the 1950s and 1960s, as classes of people were “channeled” in opposite directions by a Selective Service System that acted as a human resource planner, creating excuses and escape routes for the wealthy.<sup>30</sup> As the Vietnam conflict began to resemble wars of the past, reports from Southeast Asia showed a disproportionate number of young men from relatively poor backgrounds dying on the battlefield. Early casualty reports from the Vietnam War showed that African-Americans accounted for 20 percent of Army combat deaths from 1961 to 1966.<sup>31</sup> These reports prompted civil rights leaders to

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<sup>29</sup> Ibid., p. 205.

<sup>30</sup> Eitelberg, *Manpower for Military Occupations*, p. 7.

<sup>31</sup> Martin Binkin and Mark J. Eitelberg, *Blacks and the Military*, (Washington, DC: The Brookings Institution, 1982), p. 76.

criticize the nation and its military for unjustly using disadvantaged minorities as "cannon fodder."

Concerns about possible racial and social class connections with the draft prompted the establishment of the National Advisory Commission on Selective Service. In its February 1967 report, the commission emphasized social equity and argued that various racial, social, and economic groups should be represented in the military in times of peace and war in rough proportion to their percentage in the general population.<sup>32</sup> At about the same time, the Johnson Administration was introducing "Project 100,000," a program specifically designed to lower aptitude standards for draftees and voluntary enlistees. Project 100,000 opened the doors of military service even wider to America's lower classes and helped to bring social representation to the forefront as a sensitive political issue.

When Richard Nixon first proposed ending the draft during the 1968 presidential campaign, opponents and proponents of an all-volunteer force had already established their arguments and chosen sides. The deaths of tens of thousands of young American men sparked the debate about conscription among scholars and legislators, and claims that most servicemen came from relatively poor backgrounds added fuel to the fire.<sup>33</sup> Experts from both sides argued about the consequences of removing the draft and offered alternatives to shift the unfair burden borne by the lower classes. While

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<sup>32</sup> Binkin, *Who Will Fight the Next War? The Changing Face of the American Military*, p. 69.

<sup>33</sup> See, for example, Lawrence M. Baskir and William A. Strauss, *Chance and Circumstance: The Draft, The War, and The Vietnam Generation* (New York, NY: Random House, Inc., 1978) and Gilbert Badillo and David Curry, "Social Incidence of Vietnam Casualties," *Armed Forces & Society*, Vol. 2, May 1976, p. 397.



advocates of volunteerism argued that no system of military conscription could ever be considered “fair” and promoted the AVF as a remedy for the injustices of conscription borne by the poor and blacks, supporters of the draft system examined ways to change existing draft laws to better represent the general population. Opponents of the AVF warned against “economic conscription,” arguing that removal of the draft would force the nation’s poor to enlist in the military--selected by the “invisible hand of their own poverty.”<sup>34</sup>

*e. All-Volunteer Force: 1973 to the 21<sup>st</sup> Century*

Arguments against ending the draft were reviewed by the President’s Commission on an All-Volunteer Armed Force soon after Richard Nixon’s election in 1968. When addressing the issue of socioeconomic representation and related concerns for fairness, the President’s Commission asserted that the AVF would not differ significantly from a force composed of volunteers and conscripts. The Commission emphasized the consistent use of enlistment criteria to answer claims that only the lowest economic classes would be attracted to the AVF. According to the Commission, “maintenance of current mental, physical, and moral standards for enlistment will ensure that a better paid, volunteer force will not recruit an undue proportion of youths from lower socioeconomic backgrounds.”<sup>35</sup>

Similar concerns about the social composition of U. S. enlisted forces intensified in the 1970s and 1980s and continued to surface as the nation approached the

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<sup>34</sup> Eitelberg, *Manpower for Military Occupations*, pp. 7-8.

<sup>35</sup> The President’s Commission on an All-Volunteer Force, *The Report of the President’s Commission on an All-Volunteer Force*, p. 16.

21<sup>st</sup> century. Images of America's founding fathers and the quality of the common Revolutionary soldier spring to mind in the words of a Washington Post article entitled "Draft," written in 1981: "the very poor, the ill-educated, the hapless, the hopeless and, by some accounts, the incompetent, are paid to do the defending the rest of us are loath to do."<sup>36</sup> Similarly, the inequities of the draft systems imposed during the Civil War and World War I resound in a 1988 report by the Democratic Leadership Council, which warns that "we cannot ask the poor and under-privileged alone to defend us while our more fortunate sons and daughters take a free ride, forging ahead with their education and careers."<sup>37</sup>

As history repeats itself, and manpower policy makers, congressional committees, and government agencies wrestle with the task of selecting the "right" force in today's technologically-advanced world, particular attention will be paid to social representation. When the draft officially ended in 1973, critics anticipated the dangerous consequences of a system that recruited primarily from the underclass. Fears that the military would become a substitute for the nation's welfare system and visions of a mercenary force motivated by pay prompted scathing objections to the AVF, particularly among members of Congress who had been opposed to Nixon's initiative. While government officials voiced opposition to a program that failed to equitably represent society, analysts and political commentators predicted the creation of a serious cleavage

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<sup>36</sup> Quoted in Eitelberg, *Manpower for Military Occupations*, p. 8.

<sup>37</sup> Democratic Leadership Council, *Citizenship and National Service: A Blueprint for Civic Enterprise* (Washington, DC, May 1988), p. 25.

society, analysts and political commentators predicted the creation of a serious cleavage between the military and the rest of society under the AVF.<sup>38</sup> At congressional urging, DoD began to carefully monitor the military's ability to represent a broad cross-section of American society. DoD was also instructed by Congress to prepare an annual report that would track the demographic characteristics of recruits. At the same time, social and behavioral scientists began to study the implications of changes in population representation within the military.

### **3. Measuring Socioeconomic Status**

Prior to 1977, many of the assertions about the social "representativeness" of the military were based on "gut" feelings, "war stories," and emotions rather than on systematic analyses of data. Qualitative analyses often emerged during debates over the composition of the enlisted forces. The 1991 edition of DoD's POPREP cites three systematic analyses of the socioeconomic composition of accessions prior to the development of the SES survey in 1989. All three studies found relatively modest differences between large samples of military and civilian populations. Military members, however, tended to come from back-grounds that were somewhat lower in SES than the civilian average.<sup>39</sup>

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<sup>38</sup> Morris Janowitz, "The All-Volunteer Military as a 'Sociopolitical' Problem," *Social Problems*, February 1975, pp. 432-449.

<sup>39</sup> Department of Defense, *Population Representation in the Military Services, FY 1991*, pp. 44-45.

*a. Prior Studies*

The first systematic attempt to evaluate socioeconomic representation in the post-draft military is Cooper's 1977 study.<sup>40</sup> Cooper developed a proxy for socioeconomic background by identifying the postal ZIP codes of recruits and calculating the per capita income for each ZIP code, average family income, average educational attainment and mental aptitude, racial/ethnic composition, and other census measures. Cooper found that "there had been very little overall change in the macro distribution of enlisted accessions since the beginning of the all-volunteer force."<sup>41</sup> The use of mean income by ZIP code became the primary method for estimating SES representation in the military for the next 13 years.

In 1982, Fredland and Little used data from the National Longitudinal Survey of Youth Labor Force Behavior in a study of the socioeconomic characteristics of military personnel.<sup>42</sup> Fredland and Little focused on differences between military and civilian samples (18-22 years old) based on socioeconomic backgrounds, quality as measured by education, training, health, and educational aspirations. The sample populations were also examined according to race/ethnicity, branch of service, and, for the civilian group, expression of interest in military service. The work by Fredland and Little differs from that of Cooper in terms of methodology and the treatment of demographic groups. Nevertheless, both studies were consistent in finding only minor

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<sup>40</sup> Cooper, *Military Manpower and the All-Volunteer Force*, 1977.

<sup>41</sup> *Ibid.*, p. 223.

<sup>42</sup> J. Eric Fredland and Roger D. Little, *Socioeconomic Characteristics of the All-Volunteer Force: Evidence from the National Longitudinal Survey (1979)* (Annapolis, MD: U. S. Naval Academy, 1982).

differences between the social composition of the enlisted force and that of the general population.<sup>43</sup>

A 1989 study by Fernandez used the ZIP code approach previously employed by Cooper. Fernandez analyzed more recent data on military recruits but arrived at a similar conclusion: "The socioeconomic characteristics of recruits' home areas are broadly similar to those of the general youth population, although recruits tend to come from areas with somewhat lower family incomes and education levels."<sup>44</sup> Due to limitations on information in personnel data files, Fernandez (like Cooper) assumed that a proxy for socioeconomic background could be developed by analyzing the distribution of recruits according to income levels in their home areas.

Each of the three studies summarized above--that of Cooper, Fredland and Little, and Fernandez--provides useful information for demographic, advertising, and marketing analyses. These studies are not as reliable, however, when comparing socioeconomic representation in the military with that of the general population.<sup>45</sup> For example, in Fredland and Little, several important SES variables--such as family income and SEI--are not included, and military sample sizes are exceptionally small.<sup>46</sup> While the direction of the bias is not clear, variances of the estimates tend to be inflated in cases of

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<sup>43</sup> Ibid., pp. 2-3.

<sup>44</sup> Richard L. Fernandez, *Social Representation in the U. S. Military* (Washington, DC: Congressional Budget Office, October 1989).

<sup>45</sup> Department of Defense, *Population Representation in the Military Services FY 1995*, p. 7-3.

<sup>46</sup> In their analysis of SES background characteristics, Fredland and Little report sample sizes of 33, 82, and 122 for Hispanics, blacks, and whites, respectively.

small sample size. Additionally, the authors use only five broad categories to define parental occupation. Therefore, estimates of the socioeconomic differences between military and civilian populations may not be as accurate as estimates from studies that examine a wide range of occupational categories--such as DoD's annual POPREP.

There are also several problems in using postal ZIP codes to evaluate SES representation in the military. Cooper asserts that "differences in the socioeconomic characteristics of individuals residing in any given ZIP code (intra-ZIP code variations) are relatively minor" when compared with inter-ZIP code variations; yet, many of his findings may be biased due to the treatment of individuals as aggregates. Applying community characteristics to estimate individual SES backgrounds could result in attenuation, a "smoothing" or "blending" effect, in which parameter estimates tend to be biased toward zero.<sup>47</sup> This problem is exacerbated by the methodology used by Cooper. At the time of the study, nine digit ZIP codes were unavailable, and the analysis only uses the first few digits of the ZIP code--rather than the entire five-digit code--thus amplifying the problem of aggregation.

Several anecdotal examples are particularly useful when explaining this type of bias: A young lawyer with a lifelong subscription to Harvard Law Review can take a wrong turn outside of his high-rise studio apartment in Los Angeles and bump into a street-wise teenager whose only membership in life is to a local gang. A difference of one city block in Manhattan can equate to differences of millions of dollars in income and

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<sup>47</sup> William H. Greene, *Econometric Analysis* (New York, NY: Macmillan Publishing Co., 1990, pp. 294-297.

several degrees of educational attainment. And, expensive homes often share the same ZIP codes with those on the “other side of the tracks” in many urban, suburban, and rural areas throughout America. Thus, the use of mean or community SES characteristics may not always capture the “true” SES backgrounds of individuals.

In addition to these problems of attenuation, military applicants and recruits may not actually come from the background indicated by the ZIP code for their current address. Studies using ZIP codes do not account for individuals who may be raised in a specific area but move to a different location before their time of enlistment--a practice that may be significant among individuals coming from lower socioeconomic backgrounds who typically rent or have never owned a home. Data in the Cooper and Fernandez studies include ZIP codes for the recruit’s latest address and may not necessarily reflect the “true” background characteristics of an individual who spent most of his or her life at a different address.

***b. The SES Survey***

Limitations in the data on the socioeconomic backgrounds of military recruits and continuing interest in SES representation in the military prompted DoD to initiate a survey of recruits’ socioeconomic backgrounds. The SES survey was first administered by the Defense Manpower Data Center (DMDC) in March 1989. The objective was to collect individually-identifiable family background information from new recruits on a continuing basis, and then match the survey data with DoD personnel files to track the socioeconomic composition of active-duty enlisted personnel. Results from the SES survey have been reported in the annual DoD POPREP report since 1990;

but analyses have, thus far, been limited to cross-sectional data on the marital status of parents, education of parents, home ownership status of parents, employment status of parents, occupational category of parents, and SEI scores (based on education, income, and prestige ratings of parents' occupations computed from responses to the survey and data from the Current Population Survey [CPS], conducted by the Bureau of the Census for the Bureau of Labor Statistics).<sup>48</sup> The present study attempts to extend these analyses by tracking recruits over time and examining whether SES levels are in any way connected with individual performance in the military.

#### **4. Measuring Performance in the Military**

Several studies have attempted to measure individual performance in the military. This is a difficult task for a number of reasons. First, past studies tend to define performance as well as its independent variables differently. For instance, in 1984, Marcus and Quester used supervisors' evaluations to indicate future performance or net productivity.<sup>49</sup> In 1992, Cooke and Quester defined "successful" service in terms of an individual recruit's status at the end of his/her first term of enlistment.<sup>50</sup> Scribner et al. compared the effects of Armed Forces Qualification Test (AFQT) scores on actual tank-crew firing

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<sup>48</sup> See *Population Representation in the Military Services*, FY 1991-1995.

<sup>49</sup> Alan J. Marcus and Aline O. Quester, *Determinants of Labor Productivity in the Military* (Alexandria, VA: Center for Naval Analysis, 1984).

<sup>50</sup> Timothy W. Cooke and Aline O. Quester, "What Characterizes Successful Enlistees in the All-Volunteer Force: A Study of Male Recruits in the U. S. Navy," *Social Science Quarterly*, Vol. 73, No. 2, June 1992, pp. 239-251.



scores in 1986.<sup>51</sup> And, a year later, Horne examined the relationship between scores on the AFQT and Army Skills Qualifications Test (SQT).<sup>52</sup> Second, measures of performance tend to vary across services. Personnel in the Marine Corps, Navy, Army, and Air Force are promoted for different reasons, based on criteria that typically differ by service. Variations in measures, weighting methods, and promotion rates both within and between services compound the problems encountered when measuring performance in "the military."

*a. Cooke and Quester*

In their 1992 study entitled, "What Characterizes Successful Enlistees in the All-Volunteer Force: A Study of Male Recruits in the U. S. Navy," Cooke and Quester examine the relationship between recruit background characteristics for men enlisting in the U. S. Navy and three successful outcomes--completion of initial obligated service, completion of first term of enlistment at the rank of petty officer (E-4), and retention beyond the initial enlistment contract. The authors hypothesize that attrition behavior is strongly associated with recruit characteristics observed at the time of enlistment and appearing on personnel records established at the time; and that characteristics associated with contract completion are also generally predictive of promotion and retention. Cooke and Quester found that regular high school diploma graduates, persons with higher test scores, black or Hispanic recruits, and recruits who

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<sup>51</sup> Barry L. Scribner, D. Alton Smith, Robert H. Baldwin, and Robert L. Phillips, "Are Smart Tankers Better? AFQT and Military Productivity," *Armed Forces & Society*, Vol. 12, No. 2, Winter 1986, pp. 193-205.

<sup>52</sup> David K. Horne, "The Impact of Soldier Quality on Army Performance," *Armed Forces & Society*, Vol. 13, 1987, pp. 443-456.

enter the Navy through the Delayed Entry Program are most likely to have successful outcomes. The study by Cooke and Quester demonstrates that adaptivity to military life is a strong indicator of successful job match.<sup>53</sup>

***b. Scribner, Smith, Baldwin, and Phillips***

In their 1986 study entitled, "Are Smart Tankers Better? AFQT and Military Productivity," Scribner, et al., attempt to estimate how much tank firing scores change with AFQT scores after controlling for other factors that affect performance.<sup>54</sup> The measure of a "successful" outcome--a "tank hit"--used in this study is closely related to the mission assigned to the U. S. Army's armor force, and differs from other studies that typically used attrition and paper-and-pencil tests as proxies for performance. The results of their log-log model indicate that an increase in AFQT score results in a positive and significant increase in performance.<sup>55</sup>

***c. Other Useful Studies***

Horne's 1987 study of the relationship between AFQT and SQT scores and Marcus and Quester's 1984 study of Determinants of Labor Productivity in the Military provide other useful models when examining the relationship between SES and performance in the military. Using a linear model, Horne controls for gender, race, education, training, and experience and finds that AFQT is a significant predictor of

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<sup>53</sup> Cooke and Quester, p. 239.

<sup>54</sup> Scribner, et al., p. 201.

<sup>55</sup> Scribner et al. report that a one percent increase in AFQT score results in a .142 percent increase in tank-firing score or performance.

performance in the Army.<sup>56</sup> Marcus and Quester provide a useful approach to account for the systematic biases that arise from the inherent subjectivity of supervisor's evaluations and differences in "location" and "scale" between supervisors.<sup>57</sup>

Both paper-and-pencil tests--like the SQT--and subjective evaluations have been important indicators of performance in the military. Although use of the SQT has dwindled in recent years, the Army still administers the test to measure proficiency in certain military occupational specialties (MOS). Subjective supervisor's evaluations are currently utilized by all four services as proxies for performance. For example, the "recommendations" of immediate supervisors and proficiency and conduct marks are major determinants in the promotion process for E-1 through E-5 in the Army and Marine Corps, respectively. Difficulties in acquiring SQT scores and supervisor evaluations for this study and recommendations for further research are addressed in Chapters III and V.

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<sup>56</sup> Horne reports that the effect of AFQT on SQT varies by MOS; if a soldier scores 10 points higher on the AFQT, SQT exam scores will increase by .86 to 1.9 points. The SQT is measured on a scale of 0 to 50 points.

<sup>57</sup> Marcus and Quester address three types of systematic biases: subjectivity, location, and scale. Subjectivity bias, or the fact that evaluations reflect individual tastes, performance standards, and perceptions of the performance of others, is not a significant problem when the assignment of individuals to supervisors is random and the sample size is large. Systematic biases caused by differences in location (a supervisor's rating of average performance) and scale (the supervisor's perception of differences between the best and worst performers) are accounted for by controlling for (weighting) differences between supervisors in the regression equations.

## **5. Performance in the United States Army and Marine Corps**

The present study focuses on the effect of SES on performance in military ground forces; therefore, an examination of differences in performance measures between the Marine Corps and the Army is also useful. Since this study examines cohorts with up to seven years of service, particular attention will be paid to first-term attrition and promotion procedures for the ranks of E-1 through E-5. While both services base promotion for junior enlisted personnel--E-1 through E-3 in the Marine Corps and E-1 through E-4 in the Army--on time-in-grade, time-in-service, and supervisor recommendations, significant differences exist between the two services regarding promotion procedures for noncommissioned officers.

The Marine Corps uses a composite score for promotion to the ranks of E-4 and E-5 based on, but not limited to, rifle marksmanship scores, physical fitness test (PFT) scores, semi-annual proficiency and conduct evaluations, commanding officer recommendations, time-in-grade, and time-in-service. Table 2.1 illustrates how the Marine Corps computes an individual's composite score. The relative weights applied to proficiency and conduct evaluations, PFT scores, and rifle scores indicate their significance as determinants of performance. Approximately three-quarters of a Marine's composite score is accounted for by his or her physical fitness, ability to shoot, and a supervisor's evaluation of performance, which alone determines almost half of the total score. If an individual Marine achieves a high enough composite score in relation to the

service-wide cutting score for his or her MOS,<sup>58</sup> he or she is promoted to the next higher rank. Once Marines are eligible for promotion to E-6, they go before an MOS-specific promotion board for advancement. Promotion to the senior enlisted ranks are determined--almost entirely--by subjective supervisor's evaluations called "fitness reports."

**Table 2.1. Computation of Marine Corps Composite Scores**

Line 1-Converted Rifle Score*	Line 7-Average conduct marks* x 100 (maximum of 500 points)
Line 2-Converted PFT Score*	Line 8-Time in grade (months) x 5
Line 3-Subtotal (add lines 1 and 2)	Line 9-Time in service (months) x 2
Line 4-GMP average (line 3 divided by 1 or 2 as required)	Line 10-Special Duty Bonus (100 pts) x 1 (Drill Instructor/Recruiter/Security Guard)
Line 5-GMP score (line 4 x 100) (maximum of 500 points)	Line 11-Military Correspondence/College Courses x 15 (maximum of 75 points)
Line 6- Average Proficiency Marks* x 100 (maximum of 500 points)	Line 12-Command Recruiting Bonus x 1 (20 per recruit/100 points maximum)

**Total Composite Score:** (add lines 5 through 12)

\*Rifle marksmanship and PFT scores are converted to the same 0 to 5.0 scale used for proficiency and conduct marks.

Source: Marine Corps Enlisted Promotions Manual, MCO P1400.32B

The Army uses a point system for enlisted promotions to the ranks of E-5 and E-6. Eligible E-4s and E-5s compete Army-wide by a three-character MOS, and their relative standing is determined by total points attained on an 800-point scale. Table 2.2 provides a breakdown of the Army's promotion point system.<sup>59</sup>

<sup>58</sup> Cutting scores are computed for every MOS at Headquarter Marine Corps (HQMC) semi-annually and change based on the needs of the Marine Corps.

<sup>59</sup> Refer to Chapter Three of the Army's Enlisted Promotion Systems manual, AR 600-8-19.

**Table 2.2. Computation of Army Promotion Points**

<u>Item</u>	<b>Maximum Points</b>	
	<u>Sergeant</u>	<u>Staff Sergeant</u>
Duty Performance	200	200
SQT*	*	*
Awards and Decorations	50	50
Military Education	150	150
Civilian Education	100	100
Military Training (PFT and Marksmanship)	100	100
<u>Local Board Points</u>	<u>200</u>	<u>200</u>
<b>Total Performance Points</b>	<b>800</b>	<b>800</b>

\*SQT is no longer used in the computation of promotion points.

Source: Enlisted Army Promotions Manual, AR 600-8-19.

There are several noteworthy trends in the Army's enlisted promotion procedures. First, SQT scores are no longer used in the computation of promotion points; yet they are still considered an accurate predictor of performance in some MOSs. Second, subjective supervisor evaluations account for over half of the total points--duty performance, and to some extent, awards and decorations, are determined by unit commanders, while board points are determined by the promotion authority who conducts the local promotion board. And finally, soldiers receive significantly more credit for civilian and military education than their Marine Corps' counterparts.

Each month, the Department of the Army (DOA) establishes the total number of soldiers to be promoted and determines a cutoff score based on budgetary and strength constraints. Similar to the Marine Corps, the number of promotions is allocated by

primary MOS within these constraints. Soldiers who meet or exceed cutoff scores and time-in-grade/time-in-service eligibility requirements are promoted.

The Army--like the Marine Corps-- also uses centralized boards for its senior enlisted ranks. E-7s and above are selected for promotion by MOS by a DOA-assigned board, which carefully examines the following performance factors in the selection process: scope and variety of assignments; estimate of potential as reflected on evaluations; trends in efficiency; length of service and maturity; awards; military and civilian education; moral standards; integrity and character; and general physical condition.<sup>60</sup>

Differences in advancement criteria, occupational specialties, and the timing of promotions between services make it important to control for type of service in models that estimate the relationship between SES and performance. Although the Army and Marine Corps use similar measures to gauge individual effectiveness, inherent differences in testing procedures and promotion philosophies exist between the two services. Problems that arise from these differences are exacerbated by variations in weighting methods across services as well as differences in advancement rates for MOS or job specialties common to both services.

A comparison of Tables 2.1 and 2.2 reveals similarities and differences in the weighting methods used by each of the services. As stated previously, supervisor's evaluations are significant determinants of composite scores in both systems--over 50 percent of the total composite score is determined by proficiency and conduct marks in

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<sup>60</sup> Ibid.

the Marine Corps and by duty performance, board points, and awards in the Army. While the importance of subjective evaluations is similarly emphasized, neither service uses pencil-and-paper tests to determine eligibility for promotion as evidenced in the recent deletion of the SQT from the Army's promotion system. Varying degrees of emphasis on other measures of performance, therefore, differentiate the two services. For example, the Marine Corps weights PFT and rifle scores roughly twice as heavily as the Army does. Conversely, a soldier can accumulate over 30 percent of the total promotion points through military and civilian education, while a Marine is limited to 75 points--approximately three to five percent of his or her total composite score--for education.

Advancement rates typically differ within and between services as a result of fluctuations in the "cutoff" or "cutting" scores established by the Army and Marine Corps. These scores are determined by the needs or strength constraints for each MOS in both services and frequently change due to "ebbs" and "flows" in the manpower planning process. Additionally, shortages and overages are common in a number of MOSs in which first-term attrition and retention are difficult to predict. Although use of timing to promotion would be an ideal measure of performance to compare across services, differences in advancement rates due to changing manpower constraints would be difficult to control. Within-service comparisons may also be limited by variations in cutoff scores between MOSs and periodic adjustments to individual composite scores made by each service to meet ever-changing personnel requirements.

An examination of the criteria used to determine enlisted promotions uncovers performance measures that are considered "important" to the Army and Marine Corps.



“Successful” outcomes in the areas used to compute an individual’s composite score ultimately result in promotion to the next higher rank, increased pay, and additional leadership responsibilities. Therefore, the question that remains is: what impact, if any, does SES have on first-term attrition and the determinants of promotion listed in Tables 2.1 and 2.2? Before this study attempts to examine these relationships, a brief review of past studies that linked SES to performance is necessary.

## **6. Linking SES to Performance**

Researchers outside and within military circles have studied the effects of socioeconomic status on performance since the early 20<sup>th</sup> century. A 1981 study on Subpopulation Differences in Performance on Tests of Mental Ability provides a useful description of the evolution of research regarding the relationship between socioeconomic characteristics and individual performance. Research done during the two World Wars found that pre-service occupational differences accounted for significant differences in average scores on written performance tests. A study that measured the effect of father’s education on the test scores of children in the civilian sector revealed similar differences in performance. Studies in both military and civilian sectors have developed a hierarchy of average scores based on different socioeconomic indicators.<sup>61</sup>

Servicemen generally performed better if they entered the military as professionals (accountants, lawyers, and engineers) and progressively worse if their pre-service occupations included clerical work, a skilled trade, and semi-skilled work. Service

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<sup>61</sup> Mark J. Eitelberg, *Subpopulation Differences in Performance on Tests of Mental Ability: Historical Review and Annotated Bibliography* (Washington, DC: Office of the Secretary of Defense [Directorate for Accession Policy], August 1981), pp. 17-18.

members who entered the armed forces without any previous work experience or skills obtained the lowest scores on written performance tests. In the civilian study, children performed better, on average, if their fathers held certain occupations similar to the hierarchy of skills defined by the military studies. "In general, studies that have examined social class differences--regardless of the particular scale used to measure social position or socioeconomic status--are consistent: adults and children (above two or three years of age) from more-privileged homes perform better, on average, than those from less-privileged homes."<sup>62</sup>

A 1995 study by Haveman and Wolfe on *The Determinants of Children's Attainments: A Review of Methods and Findings* examines many of the same variables that are used in the present study. The authors find that many aspects of SES identified in previous studies are important determinants of children's success. Socioeconomic variables, including education, health care and neighborhood quality, basic family characteristics (e.g., parental education and number of siblings), and measures of numerous aspects of the home environment--such as family structure and parental interactions--are necessary when determining subsequent effects of SES on individual attainments.<sup>63</sup> Although Haveman and Wolfe discuss the effects of SES in terms of children's attainments, much of their methodology can be applied to this study.

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<sup>62</sup> Ibid., p. 18.

<sup>63</sup> Robert Haveman and Barbara Wolfe, "The Determinants of Children's Attainments: A Review of Methods and Findings," *Journal of Economic Literature*, Vol. XXXIII, December 1995, p. 1839.



### III. DATA AND METHODOLOGY

#### A. DATA

This study draws from three sources of data: the SES survey, the DoD Military Entrance Processing Command (MEPCOM) cohort files, and performance-related data files maintained by the Army and the Marine Corps. DMDC created an initial database by merging results from the SES survey with the MEPCOM cohort files, which, in turn, utilize Master and Loss files. Performance-related data files, received from the Marine Corps, were subsequently merged at the Computer Center, Naval Postgraduate School. An unsuccessful attempt was made to match and merge Army performance-related data as discussed more fully below.

The SES survey contains socioeconomic background information for military service members recruited annually from 1989 through 1995.<sup>64</sup> These data were collected using survey questionnaires developed by DMDC and administered each year to a sample of new recruits. The questionnaire--included as Appendix A in this study--asked recruits to provide information about their parents' home ownership, education levels, marital status, employment status, occupations, and other socioeconomic variables.<sup>65</sup> The responsibility for administering survey questionnaires rests with the Recruit Training

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<sup>64</sup> Years are given in fiscal years, unless otherwise stated. For example, 1989 refers to the fiscal year starting on October 1, 1988 and ending on September 1989.

<sup>65</sup> In this study, the word "parents" collectively refers to mother, father, stepparent, or guardians, unless otherwise specified.

Centers (RTCs), where an annual sample of approximately 5,000 recruits was randomly selected from each of the Army and Marine Corps recruit populations.

MEPCOM cohort files, maintained at DMDC, were obtained for enlisted recruits who entered the Army and Marine Corps during 1989 through 1995. These files track the careers of active-duty enlisted personnel in a given "cohort," where "cohort" is defined as all enlisted personnel who entered active duty in a given fiscal year. A large amount of demographic background information is available in these files as well as personnel loss actions updated through September 1995.

A third data set was created using performance measures from the Headquarters Master File (HMF) maintained by Headquarters Marine Corps (HQMC). The HMF contains information on every Marine who has served at least one day on active duty. This file is updated monthly through automated unit transaction files, and it is archived annually at HQMC. Social security numbers (SSNs) provided by DMDC were matched with those on the HMF to extract performance measures, such as Physical Fitness Test (PFT) scores, awards, and water survival qualification information. Since only a portion of the requested information resided on the HMF, additional data from the Verification Extract File (VEF), such as rifle scores, were read in as well.

Data from the three files were matched and merged using service member SSNs. As stated previously, the database, in its current form (time series, cross-sectional, pooled data), enables researchers to conduct a longitudinal study of the SES survey respondents.

SSNs and names were removed from the file after merging to protect the privacy of individuals in the sample.

## **B. METHODOLOGY**

To examine the relationship between SES and performance in the military, this study followed several steps. The explanatory and dependent variables were identified and defined after DMDC merged the SES survey with MEPCOM cohort files and Army and Marine Corps responses to data requests were received. A data audit of the independent variables and development of the multivariate regression models were accomplished based on the types of performance measures received.

This section on methodology is divided into four subsections: defining explanatory variables, defining performance variables, data audit, and methods of analyses. Several factors were considered in defining the independent and dependent variables used in the study. These include: how to categorize the variables (dichotomous, categorical, or continuous), correlations between explanatory variables, and the feasibility of combining the performance measures provided by the Marine Corps into an index. The purpose of the data audit is to compare the SES survey samples with the total Army and Marine Corps populations from which they are drawn. Several demographic and SES variables were examined to determine the existence of any systematic bias in the survey sample that could potentially affect the study results. Within the data audit, DoD-wide and civilian population data are also provided for comparative purposes. Linear and logit multivariate regressions were used to analyze the relationships between selected

performance measures and SES. For this phase, several dependent variables were selected to act as proxies for performance. First-term attrition was used as a performance measure for both services. PFT scores, rifle marksmanship scores, water survival qualifications, and awards were used solely for the Marine Corps.

## **1. Defining Explanatory Variables**

This study divides the explanatory variables into three categories: SES index variables, additional information regarding demographics of the service member's parents, and service member demographics. Individual variables in each category are discussed at length in the sections below.

### ***a. SES Index Variables***

As previously noted in Chapter II of this study, an SES index typically reflects the education, income, and prestige associated with different occupations. Employing these indicators, Stevens and Cho (1985) identified an index of SES for each of the three-digit 1980 census occupation codes. Using the SES survey, DMDC requested that military recruits identify their parents' occupations by answering questions regarding the business name, type of business, type of work, and primary duties of their mother's and father's employment. By interpreting the answers to these questions, DMDC matched parental occupations to three-digit 1980 census occupation codes, and 1990 census occupation codes in later years. Finally, each of the occupation codes was associated with a Male Socioeconomic Status Index (MSEI) and a Total Socioeconomic

Status Index (TSEI) developed by Stevens and Cho.<sup>66</sup> Furthermore, to recognize the differences associated with the distributions between male and female occupations, DMDC used MSEI for the father's SES index and TSEI for the mother's SES index in the annual POPREP.<sup>67</sup> The following two subsections define the SEI variables used to measure socioeconomic status in this study.

(1) **Parents' Highest SES Index (PSEI).** This is a continuous variable based on parents' highest TSEI value. In cases where the parents never worked, or if there is uncertainty about whether the parents worked or not, or if the parents could not be matched to one of the census occupational codes, the value is set at zero.

(2) **Parents' SES Index Not Valid (PSEI\_NV).** This is a dichotomous variable where 1 represents a service member who comes from a household where the parents never worked, the service member does not know if the parents ever worked, or the service member's parents had an occupation code that could not be matched to a valid SES index,<sup>68</sup> and 0 represents otherwise.

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<sup>66</sup> Stevens and Cho developed a total of five socioeconomic indices. TSEI1 and TSEI2 were based on the total labor force, and MSEI1, MSEI2, and MSEI3 were based on a male labor force.

<sup>67</sup> Socioeconomic indices for mothers and fathers are highly correlated. Therefore, to avoid problems of multicollinearity, this study uses the highest SES index of the parents present in the household when modeling the relationship between SES and performance. In this case, it also makes sense to apply a common scale to male and female occupations to limit the differences in occupational prestige scores. Socioeconomic indices for the total labor force--TSEIs--are used for both mothers and fathers. For dual parent households, the parents' highest TSEI--TSEI2 for mothers and TSEI1 for fathers--is used. For single-parent households, TSEI2 is used if the mother is present, and TSEI1 is used if the father is present.

<sup>68</sup> In certain cases, the sole use of a specific socioeconomic index to explain the effects of SES on performance may result in a significant loss of information. Relevant information regarding a recruit's SES is ignored by omitting data that reflect differences in occupational prestige caused by 1) parents who are not present in the family, 2) parents who never worked, 3) uncertainty about whether parents worked or not, and 4) parents who could not be matched to one of the census occupational codes. This study attempts to account for these potential variations by treating these cases collectively in the form of a dichotomous variable in the regression analysis.



***b. Parental Demographic Variables***

Parental occupation alone does not adequately explain the SES backgrounds of service members. The education and income of a recruit's parents and his or her family status are also critical. Although parental education and an enlistee's family status are explicitly available in the data, parental income is not clearly defined. Therefore, parental home ownership is used as a proxy for parental income. The parental demographic variables used in this study are described below.

(1) **Parents' Highest Level of Education.** Previous studies indicate that parents who have completed high school or attended college typically have a stronger and more positive effect on their children's attainments than do parents who have not completed high school; and, further, that a mother's education is more closely related to her children's attainment than is the father's education.<sup>69</sup> This study uses the highest level of parental education in a service member's household. In a single-parent household, educational level is determined by which parent is present; in a dual-parent household, the higher of the two parents' education levels is used. Therefore, there are four possible categories for parents' education: non-high school diploma, high school diploma graduate, attended some college, and college degree or higher. High school diploma graduate is represented as 0 for each of the three dichotomous variables listed below:

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<sup>69</sup> See Haveman and Wolfe, p. 1855.

(a) **Parent with No High School Diploma (P\_NHSD).**

This is a dichotomous variable where 1 represents an enlistee whose parent has no high school diploma, and 0 otherwise.

(b) **Parent Attended Some College (P\_SCOLL).**

This is a dichotomous variable where 1 represents an enlistee whose parent obtained some college education but not a college degree, and 0 otherwise.

(c) **Parent is College Graduate or Higher**

**(P\_COLL).** This is a dichotomous variable where 1 represents an enlistee whose parent obtained a college degree, and 0 otherwise.

(2) **Home Ownership.** Since parental income is unavailable, home ownership is used as a proxy for income and is divided into three categories: own home, rent home, and neither rent nor pay a mortgage. Previous research indicates that parental income is one of the best variables for determining the resources available to devote to children's development; thus the conclusion is that higher income has a positive and significant effect on children's attainment.<sup>70</sup> This study assumes parents who own their home have a relatively higher income than do parents who rent or parents who pay no mortgage or no rent. Parents of 18-to 24-year-olds who pay neither mortgage nor rent are assumed to have the lowest level of income.

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<sup>70</sup> Haveman and Wolfe, p. 1864.

(a) **Enlistee's Parents Own Home (OWN)**. This is a dichotomous variable where 1 represents an enlistee whose parents own a home, and 0 otherwise.

(b) **Enlistee's Parents Do Not Pay Rent or Mortgage (NOPAY)**. This is a dichotomous variable where 1 represents an enlistee whose parents do not pay rent or a mortgage on their home, and 0 otherwise.

(3) **Single-Parent Households (SPHH)**. This is a dichotomous variable where 1 represents enlistees who were raised in a single-parent household and 0 represents a dual-parent household. Research suggests that children who grow up in a single-parent household experience negative effects on their attainment, and that these negative effects are greater for black children than for white children.<sup>71</sup>

*c. Service Member's Demographics*

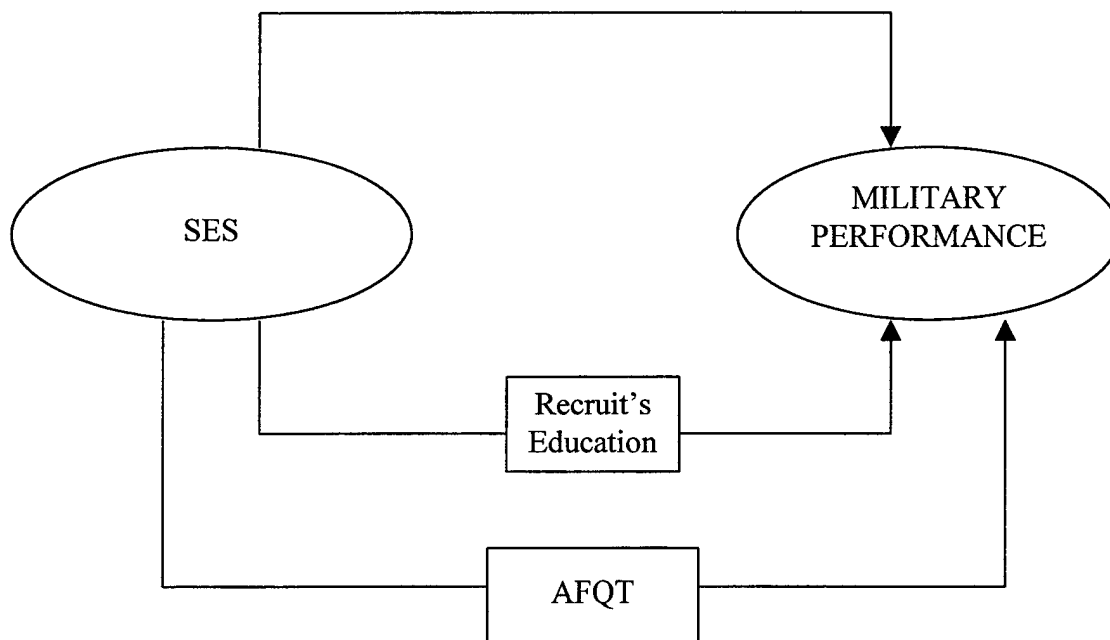
Although individual AFQT scores and education have been used as indicators of performance in previous studies,<sup>72</sup> they are excluded in this study, which attempts to capture the total effect of SES on performance. Figure 3.1 illustrates the relationship between SES variables, an enlistee's education, AFQT score, and military performance. Education and AFQT are output variables of SES and input variables of military performance. In other words, AFQT and education can be treated as either independent variables with respect to performance or as dependent variables in relation to

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<sup>71</sup> Ibid, p. 1871.

<sup>72</sup> See Horne, Cooke and Quester, Scribner et al., and Marcus and Quester.

SES. Therefore, a recruit's AFQT score and education level is omitted, because including them as explanatory variables may mask the "true" relationship between SES and "successful" outcomes in the Army and Marine Corps.<sup>73</sup>



**Figure 3.1. The Relationship Between SES, Recruit's Education, AFQT Score, and Military Performance**

Gender has also been omitted as an explanatory variable. Male and female recruits are treated separately for three reasons. First, the survey sample does not accurately represent the service population from which it is drawn with respect to gender. Significant differences in the Marine Corps data are explained in detail in the data audit section of this chapter. Second, female recruits come from slightly different SES backgrounds, as a whole, than do their male counterparts--some of which may be explained by

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<sup>73</sup> Damodar N. Gujarati, *Basic Econometrics* (New York: McGraw-Hill Book Co.), 1988, pp. 369-373.

large differences in race/ethnicity. And third, the percentage of women in both services is so small that male-only models are preferred. A summary of SES characteristics, by gender, for the Army and Marine Corps is provided in Chapter IV. The demographic characteristics used in this study are described below:

(1) **Enlistee's Geographic Region.** Four of the five 1990 census regions are used in this study: South, Northeast, North Central, and West. Recruits from outside the continental United States were not included due to the limited number of observations in the survey sample.

(a) **South (S\_DIST).** This is a dichotomous variable where 1 represents enlistees from the Southern census region, and 0 represents enlistees from locations other than the Southern census region.

(b) **North Central (NC\_DIST).** This is a dichotomous variable where 1 represents enlistees from the North Central census region, and 0 represents enlistees from locations other than the North Central census region.

(c) **West (W\_DIST).** This is a dichotomous variable where 1 represents enlistees from the Western census region, and 0 represents enlistees from locations other than the Western census region.

(2) **Race/Ethnicity.** The effect of minority status on attrition is unclear. For example, some research shows that blacks and Hispanics have a higher rate of attrition than do whites; at the same time, other research indicates that minority

service members are less likely to leave the military early.<sup>74</sup> In this study, a recruit's race/ethnicity is divided into four categories: white, black, Hispanic, and other. These categories are described as follows:

(a) **Black (BLACK)**. This is a dichotomous variable where 1 represents a black enlistee, and 0 represents a non-black enlistee.

(b) **Hispanic (HISPAN)**. This is a dichotomous variable where 1 represents an Hispanic enlistee, and 0 represents a non-Hispanic enlistee.

(c) **Other Minorities (OTHMIN)**. This is a dichotomous variable where 1 represents an American Indian, Alaskan Native, Asian/Pacific Islander, and all other minority enlistees that are not included in Black and Hispanic categories, and 0 represents otherwise.

(3) **Enlistee's Age (AGE)**. This is a continuous variable representing an enlistee's age upon entering the Army or Marine Corps.

Table 3.1--included below--provides a summary of the explanatory variables.

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<sup>74</sup> Cooke and Quester, p. 239.

**Table 3.1. Explanatory Variables and Definitions Used in the Study**

<b>Explanatory Variables</b>	<b>Definitions</b>
Parents' Highest SES Index	PSEI = Continuous variable if valid PSEI = 0 if not valid
Parents' Highest SES Index Not Valid	PSEI_NV = 1 if parents never worked, the recruit does not know if parents ever worked, or parent(s) occupation could not be matched to a valid TSEI.
	PSEI_NV = 0 if otherwise
Parents' Highest Level of Education	P_NHSD = 1 if no high school diploma P_NHSD = 0 if otherwise P_SCOLL = 1 if some college P_SCOLL = 0 if otherwise P_COLL = 1 if college graduate or higher P_COLL = 0 if otherwise
Parental Home Ownership	OWN = 1 if parent owns home OWN = 0 if both parents are present NOPAY = 1 if parent does not pay rent or mortgage NOPAY = 0 if otherwise
Single-parent Household	SPHH = 1 if one parent is present SPHH = 0 if otherwise
Census Region	S_DIST = 1 if from South census region S_DIST = 0 if otherwise NC_DIST = 1 if from North Central census region NC_DIST = 0 if otherwise W_DIST = 1 if from West census region W_DIST = 0 if otherwise
Service Member's Race	BLACK = 1 if black BLACK = 0 if otherwise HISPAN = 1 if Hispanic HISPAN = 0 if otherwise OTHMIN = 1 if other minority OTHMIN = 0 if otherwise
Service Member's Age	AGE = continuous variable

## **2. Defining Performance Variables**

Several dependent variables were used in this study as proxies for enlisted performance. Attrition was used to identify enlistees who were discharged from the Army or Marine Corps prior to the completion of their initial term of enlistment. Data on first-term attrition<sup>75</sup> were readily available from the Master and Loss records maintained in the MEPCOM cohort files. As discussed in Chapter II, other performance variables common to both the Army and Marine Corps--such as promotion points--were not explored in this analysis due to differences in promotion criteria and advancement rates between services.

In addition to information on first-term attrition contained in the MEPCOM cohort files, requests for various performance measures were sent to the Army and Marine Corps liaisons at DMDC West. These requests-- "Performance Data Wish-Lists"--have been included in this study as Appendices B and C, respectively. Both lists represent attempts to obtain information on most of the performance criteria used in the computation of composite scores. Receipt of subjective supervisor's evaluations, awards, PFT scores, and rifle marksmanship scores would allow researchers to duplicate a significant portion of the performance scores used to determine promotion in the Army and Marine Corps.

A series of problems were encountered in the process of retrieving performance-related data from the separate services. While the Marine Corps representative at DMDC

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<sup>75</sup> In this study, first-term attrition is defined as the recruit's initial 48-month obligation.



required extensive administrative procedures to release performance data, DMDC maintained files on only three of the nine categories of Army performance measures requested: awards, physical fitness scores, and legal administration. Preliminary analysis of all three Army performance variables revealed exceptionally small sample sizes. During the SSN merging process, an insignificant number of enlistees was found who had participated in the SES survey and matched with the performance-related data.

Several problems were encountered in obtaining additional performance measures for the Army. First, the Army maintains records for many of its performance-related data locally--at the company level--and promotions to the ranks of E-2 through E-4 are determined using time-in-grade, time-in-service, and recommendations from a soldier's chain of command. Second, the Army does not automate a majority of its performance data. This lack of automation may be explained by the size of the Army in comparison with the other services as well as differences in promotion procedures. The decentralized process--the use of local records--to promote junior enlisted soldiers precludes the need for Army-wide maintenance of performance-related data for persons in pay grades E-1 through E-4.

The Marine Corps, on the other hand, automates 100 percent of the performance measures used to compute an individual Marine's composite score. The data required for this study--contained in the HMF and VEF files--are updated monthly at the unit level and archived annually at HQMC. While the SSN merging process at HQMC would result in a database containing demographic, SES, and performance-related data, several factors complicated the process. First, the file layout of the HMF changed periodically

from 1989 to 1996, requiring different programming procedures to extract the data every time a change occurred. To cover the seven-year period examined, approximately 10 separate SAS jobs were run to extract the appropriate data--each time adding variables to the existing data set. Second, the list of 21,000 SSNs sent to HQMC was matched with over 500,000 files maintained on the HMF and VEF collectively. A considerable amount of time is required when this matching process must occur 10 separate times to account for the file layout changes discussed above. Remarkably enough, the entire data collection process was achieved in less than two months by a Marine Corporal, Eric Green, working at the Manpower Information Division at HQMC. His efforts resulted in the inclusion of PFT scores, rifle marksmanship scores, water survival qualifications, and awards data for the six Marine Corps cohorts used in this study.

*a. First-Term Attrition*

First-term attrition is a useful proxy for performance in both the Army and Marine Corps, because it is essentially measured the same in both services. Cooke and Quester used first-term attrition as one of three measures of recruit success and demonstrated that adaptability to military life is a strong indicator of a successful job-person match.<sup>76</sup> In this study, three categories of first-term attrition are identified based on specific criteria--interservice separation codes (ISCs)--used to discharge enlisted personnel from the armed forces. In addition to identifying all enlisted personnel discharged during an initial term of enlistment, ISCs were used to separate recruits who

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<sup>76</sup> See Cooke and Quester, p. 239.

were discharged, based on their failure to meet behavioral/performance criteria, from those who failed to meet minimum non-behavioral criteria. Each type of first-term attrition was treated as a dichotomous variable where attrition equals 1 and non-attrition equals 0.

(1) **Attrition 1 (ATT1)**. This variable represents enlistees who were discharged during their initial term of enlistment based on failure to meet minimum behavioral or performance criteria. These personnel were specifically identified by ISCs 60 through 87, 101, and 102. Descriptions of behavioral-related ISCs are listed in Table 3.2.

**Table 3.2. Interservice Separation Codes (ISCs) for Enlisted Personnel Discharged Based on Failure to Meet Minimum Behavioral or Performance Criteria**

<b>Behavioral and Performance-Related ISCs</b>	<b>Definition</b>
60	Character or Behavior Disorder
61	Motivational Problems (Apathy)
62	Enuresis
63	Inaptitude
64	Alcoholism
65	Discreditable Incidents
66	Shirking
67	Drugs
68	Financial Irresponsibility
69	Lack of Dependent Support
70	Civil Court Conviction
71	Civil Court Conviction
72	Security
73	Court Martial
74	Fraudulent Entry
75	AWOL, Desertion
76	Homosexuality

**Table 3.2 (Continued)**

<b>Behavioral and Performance-Related ISCs</b>	<b>Definition</b>
77	Sexual Perversion
78	Good of Service
79	Juvenile Offender
80	Misconduct
81	Unfitness (Reason Unknown)
82	Unsuitability
83	Pattern of Minor Disciplinary Infractions
84	Commission of a Serious Offense
85	Failure to Meet Minimum Qualifications for Retention
86	Expedition Discharge/Unsatisfactory Performance
87	Trainee Discharge/Entry Level Performance and Conduct
101	Dropped from Strength for Desertion
102	Dropped from Strength for Imprisonment

Source: Defense Manpower Data Center.

(2) **Attrition 2 (ATT2)**. This variable represents enlistees who were discharged during their initial term of enlistment based on non-behavioral criteria, such as medical discharges or family hardships. These personnel were specifically identified by ISCs 10 through 22 and 90 through 99. Descriptions of non-behavioral-related ISCs are shown in Table 3.3.

**Table 3.3. Interservice Separation Codes (ISCs) for Enlisted Personnel Discharged Based on Non-Behavioral Criteria**

<b>Non-Behavioral-Related ISCs</b>	<b>Definition</b>
<b>Medical Disqualifications</b>	
10	Conditions Existing Prior to Service
11	Disability - Severance Pay
12	Permanent Disability - Retired
13	Temporary Disability - Retired
14	Disability - Non EPTS - No Severance Pay

**Table 3.3 (Continued)**

<b>Non-Behavioral-Related ISCs</b>	<b>Definition</b>
16	Unqualified for Active Duty - Other
17	Failure to Meet Weight Body Fat Standards
Dependency or Hardship	
22	Dependency or Hardship
Other Separations or Discharges	
90	Secretarial Authority
91	Erroneous Enlistment or Induction
92	Sole Surviving Family Member
93	Marriage
94	Pregnancy
95	Underage (Minor)
96	Conscientious Objector
97	Parenthood
98	Breach of Contract
99	Other

Source: Defense Manpower Data Center.

(3) **Attrition 3 (ATT3).** This variable represents all enlistees who were discharged during their initial term of enlistment based on either performance/behavioral or non-behavioral criteria. These personnel were identified by ISCs presented in both Tables 3.2 and 3.3.

***b. Other Enlisted Performance Measures***

Of the performance-related data requested from both services (see Appendices B and C), usable data on four Marine Corps' measures were received: PFT scores, rifle marksmanship scores, water survival qualifications, and awards. Several factors were considered in determining how to define these performance variables. First, rifle scores were received in truncated form (intervals of ten). For example, if a Marine

qualified with either a 221 or 227 with the rifle, the data showed a score of 22. Second, PFT scores and rifle marksmanship scores are converted and used together to determine 25 percent of a Marine's composite score. Third, awards could be defined a number of ways--using an index or individually, as well as by precedence or by frequency. Fourth, each of the performance measures could be treated as a dichotomous variable by differentiating between those recruits who had achieved "successful" outcomes and those who had not. And, finally, for three of the four performance measures--including PFT, rifle marksmanship, and water survival qualifications--several distinct categories or levels of performance exist.<sup>77</sup>

Each of the Marine Corps performance measures could be treated as continuous, dichotomous, or categorical variables. Therefore, considerations for modeling-- discussed in detail in the final section of this chapter--played an important part in how we chose to define the dependent variables. In this study, PFT and rifle marksmanship scores are treated as continuous variables, and water survival qualifications and awards are treated as dichotomous variables.

(1) **Physical Fitness Score (PFT\_SCOR)**. This is a continuous variable with a theoretical range of 0 to 300. PFT scores of 123 to 300 were used as a relevant range in this study, because no scores below 123 were reported.

(2) **Rifle Marksmanship Score (R\_SCORE)**. This is a continuous variable with a theoretical range of 0 to 250. Rifle marksmanship scores of

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<sup>77</sup> The Marine Corps divides PFT and rifle marksmanship scores into four categories: first class, second class, third class, and unqualified for PFT; and expert, sharpshooter, marksman, and unqualified for rifle. Swim qualifications can be categorized into six groups: unqualified, fourth through first class, and WSQ and above.

100 to 250 were used as a relevant range in this study, because no scores below 100 were reported. Additionally, scores were grouped in intervals of tens, resulting in 16 categories of rifle scores.

(3) **Water Survival Qualification (WATER\_QL)**. This is a dichotomous variable where 1 represents Marines who qualified as second or first class swimmers, WSQ, and instructors, and 0 represents Marines who qualified as third and fourth class swimmers or failed to qualify.

(4) **Personal Awards (AWARDS)**. This is a dichotomous variable where 1 represents Marines who have received one or more personal awards, and 0 represents Marines who have never received a personal award.

*c. Hypothesized Effects*

The process of hypothesizing the effects of the various demographic and SES variables on performance is a useful prelude to the data audit and methods of analyses sections. Table 3.4 illustrates the expected relationships between the explanatory and dependent variables used in this study. For example, as parent's highest level of education increases, a recruit is less likely to be discharged prematurely during his or her first term of enlistment and more likely to achieve higher levels of success on other measures of performance.

**Table 3.4. Explanatory Variables and Their Hypothesized Effects on Performance\***

Explanatory Variables	Hypothesized Effects on:	
	Attrition	Performance
PSEI (increase)	-	+
PSEI_NV	+	-
Parents' Highest Level of Education (increase)	-	+
OWN	-	+
Single-parent Household	+	-
Census Region	Unknown	Unknown
Race/Ethnicity	Unknown	unknown
AGE (increase)	+	-

\*An expected positive relationship between an explanatory variable and a performance variable is denoted by a "+" sign, while a "-" sign indicates a hypothesized negative relationship. For example, as Parents' Highest SEI (PSEI) increases, this study hypothesizes that a recruit is less likely to attrite (-) and more likely to have a "successful" out-come in the other measures of performance used in this study.

### **3. Data Audit**

The following data audit examines demographic characteristics of non-prior service, active-duty enlisted personnel who entered the Army or Marine Corps between 1989 and 1995.

The SES survey sample used in this study contains a total of 106,232 observations, including active-duty service members, reservists, and National Guard enlisted personnel from the four DoD services recruited during 1989 through 1995. After deleting Navy and Air Force personnel and reserve, National Guard, and prior-service personnel from the Army and Marine Corps, a total of 42,631 observations remained. Of these, the Army portion of the sample consisted of 21,590 observations, and the Marine Corps data consisted of 21,041 observations. Tables 3.5 through 3.11 compare the demographic characteristics of the survey sample with those of the recruit populations from which they



were drawn. The demographic variables used in the comparison are gender, high school graduate status (diploma), "high quality" status (a combination of education and aptitude test scores), and race/ethnicity. In addition, comparison measures are presented for the CPS population of 18 to 24-year-olds.

**a. Gender**

Table 3.5 illustrates the proportions of female 18-to 24-year-old recruits in both the Army and Marine Corps and provides a comparison of proportions within and across services as well as between survey samples, service populations, and the CPS.

**Table 3.5. Comparison of the Percentage of Women\* in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Survey Sample	Service Population	Survey Sample	Service Population	CPS
1989	8.5	14.3	0.0	6.4	51.3
1990	10.1	14.9	1.6	5.3	51.1
1991	12.6	14.5	0.0	5.4	51.0
1992	12.8	16.3	5.4	5.0	50.9
1993	16.8	16.0	0.0	4.6	50.7
1994	9.8	18.2	18.8	5.4	50.4
1995	15.0	18.7	0.0	5.9	50.3

\*Women in the SES survey sample and service populations include non-prior service, active-duty enlisted accessions.

Source: Data on the service population and CPS are from Department of Defense, Population Representation in the Military Services: Fiscal Year 1995 (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

Gender trends and the percentages of women in the survey samples and service populations in the Army and Marine Corps do not compare well. In all but one

year in the Army and two years in the Marine Corps, women are underrepresented in the survey sample, based on the proportion of women in the service population.

The percentages of female recruits in the Marine Corps survey sample fluctuate significantly during 1989 through 1995, while the Marine Corps, as a whole, appears to be at steady-state between 5 and 6 percent for the same years. Differences in the administration of the SES survey and Marine Corps policy to segregate recruit training may account for the large differences in the reported percentages, which range from 0 to 18.8 percent. For example, female recruits are trained exclusively at the Marine Corps Recruit Depot (MCRD) in Parris Island, South Carolina in segregated companies, which start training on a specific day of the week during selected months of the year. At the same time, recruits trained at MCRD, San Diego, California are all male. A random sample that draws recruits trained at MCRD San Diego or Parris Island may result in disproportionately low or high overall percentages of women. Therefore, variations in the location and timing of the SES survey may explain the large range of differences in the proportion of women in the survey compared with that in the Marine Corps' cohorts as a whole.

As stated previously, the large differences between the survey sample and the service population, with respect to female enlistees in the Marine Corps, may result in biased results when using gender as an independent variable. To avoid this bias, female enlistees are deleted from this study. Additionally, for comparative purposes, this study includes male recruits only for both the Army and Marine Corps when modeling the

relationship between SES and performance in the military. For the remainder of the data audit, however, male and female recruits are combined to compare the SES survey sample data with the data for the total populations provided in the POPREP.

***b. Education***

Table 3.6 illustrates the proportion of 18-to 24-year-old recruits in the SES survey who have a high school diploma, compared with the service populations of the Army and Marine Corps.

**Table 3.6. Comparison of the Percentage of High School Diploma Graduates\* in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Survey Sample	Service Population	Survey Sample	Service Population	CPS
1989	86.9	88.6	92.1	94.6	80.1
1990	91.4	94.2	92.7	93.3	79.0
1991	94.0	96.4	95.1	95.8	79.2
1992	96.2	98.7	96.6	97.4	79.9
1993	90.5	93.0	95.0	96.0	79.9
1994	90.2	92.9	96.0	95.3	80.1
1995	90.9	93.8	95.4	94.9	79.3

\*Graduates for the SES survey sample and service populations include non-prior service, active-duty enlisted accessions with a high school diploma; General Educational Development (GED) and alternative credentials are not included.

Source: Data on the service population and CPS are from Department of Defense, Population Representation in the Military Services: Fiscal Year 1995 (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

Comparisons of the percentages of high school graduates in the survey samples and service populations for both the Army and Marine Corps reveal that the

samples follow the same general trends as found in the service population, but with consistently lower averages for the sample data. An across-service comparison reveals that the Marine Corps recruits a slightly larger proportion of high school graduates than does the Army.

*c. High-Quality Recruits*

Table 3.7 shows the proportion of high-quality recruits in the SES survey sample and in the Army and Marine Corps as a whole. The survey sample is generally

**Table 3.7. Comparison of the Percentage of High-Quality\* Recruits in the SES Survey Sample, Total Service Population, and Department of Defense (DoD), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		DoD
	Survey Sample	Service Population	Survey Sample	Service Population	DoD Population
1989	58.2	53.7	66.1	62.8	57.1
1990	62.3	61.2	65.3	61.2	62.4
1991	73.2	71.3	67.4	65.6	68.6
1992	79.9	76.4	72.2	68.8	73.1
1993	65.4	64.6	67.7	65.4	66.4
1994	66.0	64.1	69.3	63.1	66.0
1995	66.5	63.6	66.1	62.1	65.6

\*High-quality recruits are defined as non-prior service, active-duty enlisted accessions who are high school graduates and scored at or above the 50th percentile on the AFQT.

Source: Data for the service population and CPS are from Department of Defense, *Population Representation in the Military Services: Fiscal Year 1995* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

representative of the service populations within the Army and the Marine Corps, with slightly higher averages in the sample data. Additionally, both services appear to reflect the DoD average of high-quality recruits.

**d. Race/Ethnicity**

Tables 3.8 through 3.11 show the proportions of recruits by race/ethnicity in the Army and Marine Corps survey samples and total service populations. Some minor differences are found between the racial/ethnic composition of the service samples and the service populations; and, in certain years, differences are more apparent than in others. Nevertheless, the survey samples are considered generally representative of the service populations across all racial/ethnic backgrounds, with just minor differences.

**Table 3.8. Comparison of the Percentage of White\* 18-to 24-Year-Olds in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Survey Sample	Service Population	Survey Sample	Service Population	CPS
1989	65.9	65.1	74.6	71.5	72.1
1990	68.9	65.6	69.7	70.8	71.9
1991	73.6	70.8	73.8	74.3	71.2
1992	72.4	69.8	72.9	74.9	70.6
1993	70.4	69.5	74.6	74.6	70.1
1994	68.8	67.1	72.3	73.1	68.7
1995	67.0	65.9	72.7	70.9	68.2

\*White 18-to 24-year-olds in the SES survey sample and service populations include non-prior service, active-duty enlisted accessions.

Source: Data for service population and CPS are from Department of Defense, *Population Representation in the Military Services: Fiscal Year 1995* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

**Table 3.9. Comparison of the Percentage of Black\* 18-to 24-Year-Olds in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Sample Survey	Service Population	Sample Survey	Service Population	CPS
1989	25.2	26.3	15.8	17.9	13.7
1990	22.1	25.2	15.6	17.6	13.9
1991	17.8	20.0	13.1	14.2	14.1
1992	18.3	20.4	12.4	13.0	14.2
1993	19.2	20.4	13.2	12.1	14.3
1994	20.1	22.2	14.1	12.7	14.2
1995	21.4	22.5	9.5	13.3	14.3

\*Black 18-to 24-year-olds in the SES survey sample and service populations include non-prior service, active-duty enlisted accessions.

Source: Data for service population and CPS are from Department of Defense, *Population Representation in the Military Services: Fiscal Year 1995* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

**Table 3.10. Comparison of the Percentage of Hispanic\* 18-to 24-Year-Olds in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Sample Survey	Service Population	Sample Survey	Service Population	CPS
1989	6.1	5.6	6.6	7.4	10.7
1990	6.0	6.2	11.1	8.4	10.8
1991	5.8	6.1	9.5	8.3	11.1
1992	6.5	6.7	9.9	8.6	11.3
1993	6.8	6.7	8.7	9.7	11.5
1994	7.0	7.2	10.1	10.8	13.0
1995	7.9	7.8	14.1	12.3	13.9

\*Hispanic 18-to 24-year-olds in the SES survey sample and service populations include non-prior service, active-duty enlisted accessions.

Source: Data for service population and CPS are from Department of Defense, *Population Representation in the Military Services: Fiscal Year 1995* (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

**Table 3.11. Comparison of the Percentage of Other Minority\* 18-to 24-Year-Olds in the SES Survey Sample, Total Service Population, and Current Population Survey (CPS), Fiscal Years 1989-1995**

FISCAL YEAR	ARMY		MARINE CORPS		18-24 YR-OLDS
	Sample Survey	Service Population	Sample Survey	Service Population	CPS
1989	2.8	3.0	3.0	3.3	3.5
1990	3.0	3.0	3.6	3.3	3.4
1991	2.8	3.1	3.6	3.3	3.7
1992	2.8	3.1	4.9	3.5	3.9
1993	3.6	3.4	3.5	3.6	4.0
1994	4.1	3.5	3.4	3.4	4.1
1995	3.7	3.8	3.7	3.6	3.6

\*Other Minority 18-to 24-year-olds in the SES survey sample and service populations include non-prior service, active-duty enlisted accessions.

Source: Data for service population and CPS are from Department of Defense, *Population Representation in the Military Services: Fiscal Year 1995*, (Washington, DC: Office of the Assistant Secretary of Defense [Force Management Policy]), 1996.

Since the SES survey was administered randomly to recruits from the Army and Marine Corps, and the survey sample is a random selection of the service populations, there is no reason to believe that systematic biases exist between the survey samples and service populations. Tables 3.6 through 3.11 indicate that the SES survey samples are generally representative of the total service populations from which they are drawn. However, as discussed previously, Table 3.5 shows that the percentages of women in the Marine Corps' survey samples are significantly different from the comparable proportions of women in the population of all Marine recruits. Therefore, female enlistees are deleted from the models used in this study to avoid systematic biases in the

results and to ensure consistency when comparing across services. This should not affect the results, since male recruits represent a significant portion of the survey samples and service populations.

#### **4. Methods of Analyses**

Two methods of multivariate data analysis are used to quantify the relationship between SES and performance in the Army and Marine Corps. Ordinary Least Squares (OLS) regression analysis is used for the dependent variables that are continuous, such as Marine Corps PFT and rifle marksmanship scores, and Logistic (Logit) regression analysis is used for binary choice dependent variables, such as first-term attrition, water survival qualifications, and awards. Descriptions of OLS and Logit are included in the following two subsections.

##### ***a. Ordinary Least Squares (OLS) Regression Analysis***

OLS is the most extensively used method of constructing the sample regression function in multivariate regression analysis for several reasons. First, the method of least squares chooses parameter estimates while minimizing the error term. Second, OLS estimators are easily computed, because they are expressed solely in terms of the observable (sample) quantities of the explanatory (X) and dependent (Y) variables. Third, once the OLS estimates are obtained from the sample data, the sample regression line can be easily obtained as it passes through the sample means of X and Y. And, finally, the linear relationship that exists in OLS models simplifies the interpretation of



the parameter estimates. For example, a one-unit change in X results in a (one parameter estimate) unit change in Y.<sup>78</sup>

This study uses the method of ordinary least squares to quantify the relationship between a set of explanatory variables and two continuous dependent variables--PFT scores and rifle marksmanship scores. Variables used in each OLS model are explained below in Table 3.12.

**Table 3.12. Ordinary Least Squares Regression Models**

Marine Corps PFT Scores:

$PFT\_SCOR = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

Marine Corps Rifle Marksmanship Scores:

$R\_SCORE = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

***b. Logistic (Logit) Regression Analysis***

In cases where a clear division can be made between successful performance and lower levels of performance or failure, such as first-term attrition, water survival qualifications, and awards, linear probability, probit, and logit models can be used.

While all of these techniques are appropriate when estimating the relationship between a

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<sup>78</sup> This paragraph draws heavily from the discussion of OLS in Gujarati, *Basic Econometrics*, pp. 52-80.

set of explanatory variables and a dichotomous dependent variable, this study uses the logit model.

Therefore, The model of the relationship between the explanatory variables and first-term attrition, water survival qualifications, and awards is based on the cumulative logistic distribution function:

$$P_i = \frac{1}{(1+e^{-(EB_iX_i)})}$$

where  $P_i$  = the probability of successful performance

$X_i$  = a row vector of service member SES and cohort specific characteristics, and

$B_i$  = a column vector of parameters to be estimated.

The logit model was selected over alternative methods such as the linear probability model or the probit model for several reasons. First, unlike the linear probability model, which is unbounded, the logit model restricts the probabilities to lie between zero and one. That is,

$$P_i \rightarrow 0 \text{ when } B_i X_i \rightarrow -\infty \text{ and } P_i \rightarrow 1 \text{ when } B_i X_i \rightarrow +\infty.$$

Second, although the logit is linear in  $X_i$ , the probabilities themselves are not. This differs from the linear probability model where the probabilities increase linearly with  $X_i$ .<sup>79</sup> The logit model is used, because it is reasonable to assume that the values of the explanatory variables increase or decrease indefinitely.

Logit was selected over probit primarily, because it is generally less computationally involved. Maximum Likelihood Estimation (MLE) is used to estimate

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<sup>79</sup> For a discussion of logit, see Gujarati, *Basic Econometrics*, pp. 452-475.

model coefficients. The following logit models were used to estimate the effects of SES and service member characteristics on performance. Variables used in each logit model are explained in Table 3.13 below.

**Table 3.13. Logistic Multivariate Regression Models**

Behavioral and Performance-Related Attrition (Attrition1):

$ATT1 = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

Non-Behavioral Attrition (Attrition2):

$ATT2 = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

Overall First-Term Attrition (Attrition3):

$ATT3 = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

Marine Corps Water Survival Qualifications:

$WATER\_QL = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

Marine Corps Awards:

$AWARDS = f(PSEI, PSEI\_NV, P\_NHSD, P\_SCOLL, P\_COLL, OWN, NOPAY, SPHH, S\_DIST, NC\_DIST, W\_DIST, BLACK, HISPAN, OTHMIN, AGE)$

### ***c. Validating the Models***

To validate the performance models defined in the previous two sections, this study analyzed the relationship between SES and AFQT scores. The results of this

model--included as Appendix D--illustrate the usefulness of each of the SES variables. In other words, the explanatory variables defined in this study can be considered "good" measures of performance, because the expected effects of SES on AFQT were confirmed and were consistent for both the Army and Marine Corps. With the exception of region, each of the SES variables had a significant effect on AFQT scores. In the next chapter, this study examines the results of the linear and logit models defined for PFT and rifle marksmanship scores and first-term attrition, water survival qualifications, and awards, respectively. Based on the results presented in Appendix D, the authors expect that SES will have significant effects on the variables used to measure performance in this study.



## **IV. STATISTICAL ANALYSIS AND RESULTS**

### **A. INTRODUCTION**

This chapter provides results of cross tabulation and multivariate regression analyses. Several procedures are used to determine the socioeconomic backgrounds of recruits, overall population representation of the armed forces, and the relationship between SES and military performance. First, Army and Marine Corps recruit SES background characteristics are compared with CPS data for the 18-to 24-year-old civilian population. These characteristics include parents' occupation, education, and home ownership. Simple cross tabulations are used to examine significant differences that exist between enlistees' SES and that of the civilian population for all three of these variables. Second, several factors are considered that may explain these differences. Such factors include the following: family status, race/ethnicity, census region, gender, reasons for joining the military, and the omission of officers from the military data. The final section of the chapter summarizes the results of the logit and OLS regression models used to analyze the effects of SES on performance. The analysis looks at both parameter estimates and marginal effects and provides a detailed comparison of three "typical" recruits in the Army and Marine Corps for each of the performance measures.

### **B. SES REPRESENTATION**

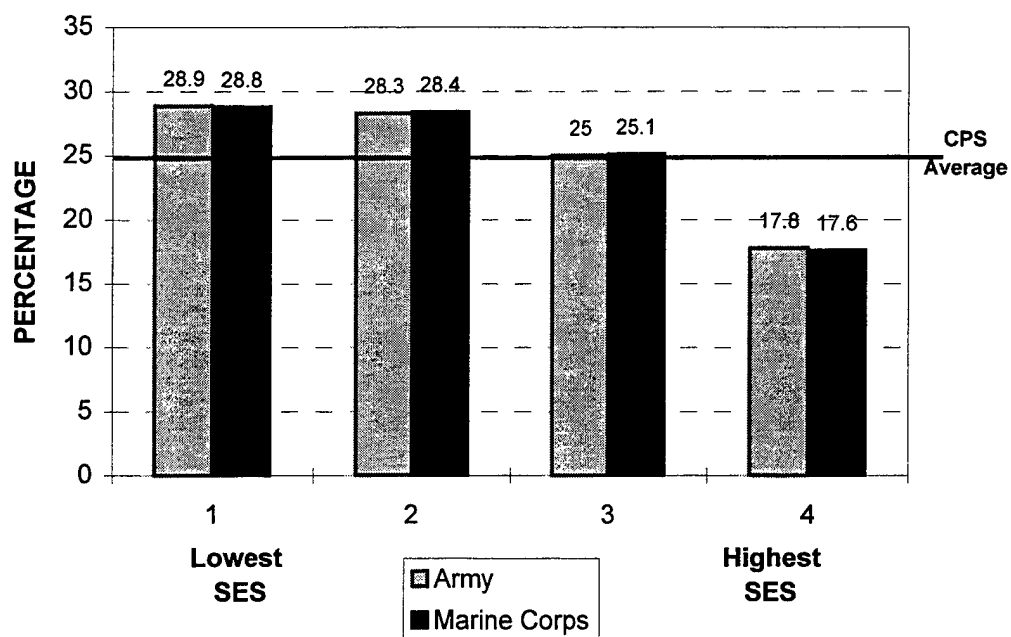
On average, recruits in both services come from slightly lower SES backgrounds than found in the general population. These differences are best explained by comparing mean levels of MSEI (fathers) and TSEI (mothers) for soldiers and Marines with those of

the CPS. SES indices are good indicators of overall SES representation in the Army and Marine Corps, because they reflect parents' average levels of education, income, and prestige within occupations. Figures 4.1 and 4.2 compare SES indices for fathers and mothers of Army and Marine Corps active-duty enlisted accessions with those of a comparable population in the CPS. The quartiles divide CPS parents into equal fourths with respect to SES; and Army and Marine Corps recruit parents' are then distributed among these quartiles. The results, as seen in Figures 4.1, show that the fathers of enlistees are considerably underrepresented in the highest SES quartile, almost perfectly represented in the next highest quartile (the "upper-middle" SES division), and generally overrepresented in the lower two SES quartiles, when compared with the fathers of 18-to 24-year-old civilians.

The results for mothers of enlistees (Figure 4.2) are somewhat different from the findings regarding fathers. Here, mothers are similarly under-represented in the highest SES quartile and overrepresented in the lowest; but mothers are also overrepresented in the upper-middle quartile and represented in the lower-middle quartile. Thus, the trend for mothers in the middle two quartiles is the converse of that for fathers, with a greater concentration of the upper end of the SES range.

Socioeconomic indices are good overall indicators of SES representation, because they combine variables such as education, income, and the prestige levels of occupations. It is also useful to examine each of these variables individually. In the next three subsections, this study identifies differences between the SES survey population and the CPS

### Recruits versus CPS Fathers: A Comparison by MSEI Quartiles

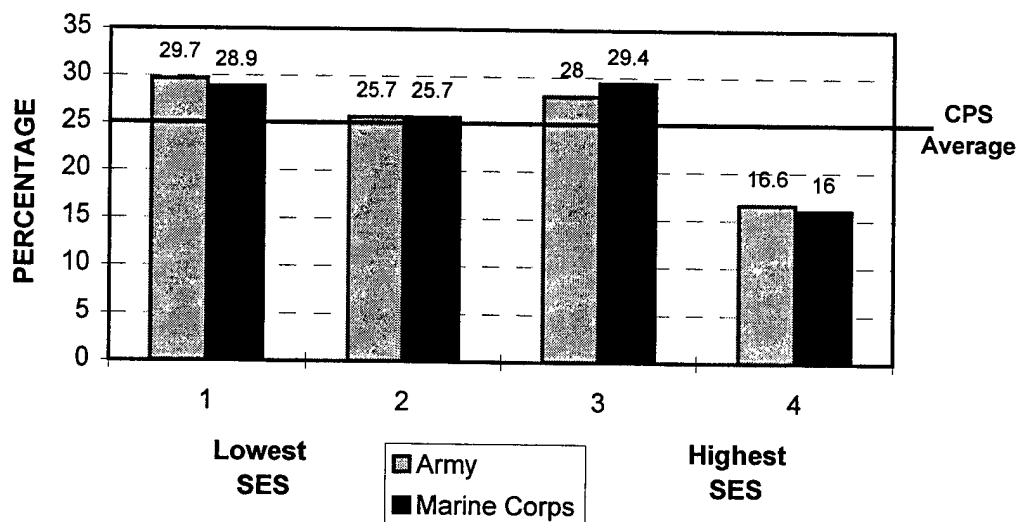


Source: Derived from data provided by the Defense Manpower Data Center.

**Figure 4.1. Comparison of Male Socioeconomic Indices (MSEIs) for Fathers of Army and Marine Corps Non-Prior Service, Active-Duty Recruits with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**



### Recruits versus CPS Mothers: A Comparison by TSEI Quartiles



Source: Derived from data provided by the Defense Manpower Data Center.

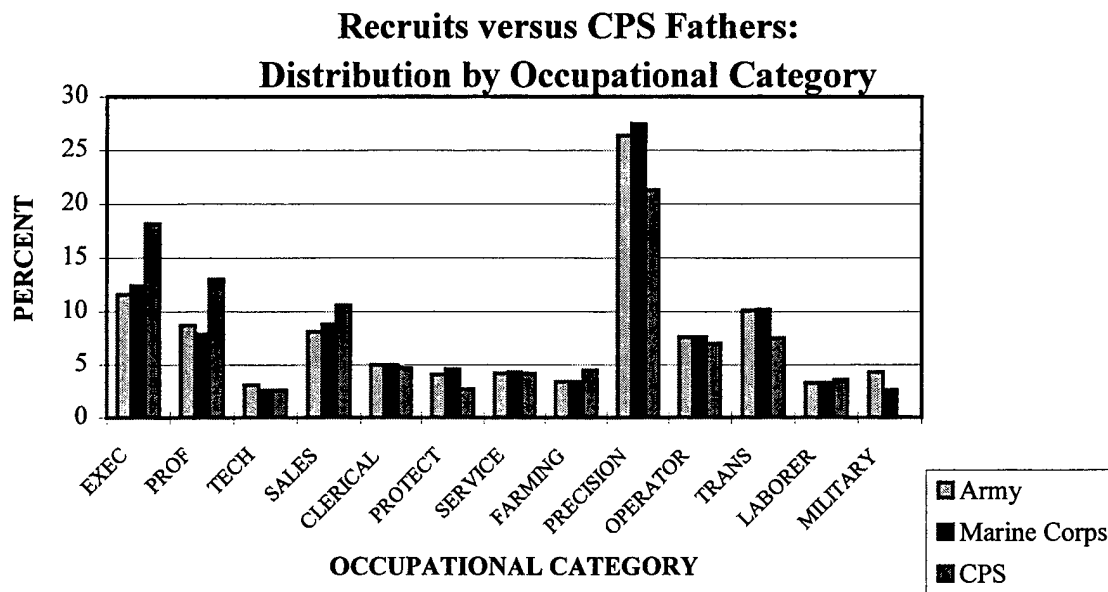
**Figure 4.2. Comparison of Total Socioeconomic Indices (TSEIs) for Mothers of Army and Marine Corps Non-Prior Service, Active-Duty Recruits with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

sample with respect to parents' occupational categories, education levels, and home ownership. Previous research is used as a guide in examining these differences.<sup>80</sup>

#### 1. Parents' Occupation

Figures 4.3 and 4.4 compare the percentage distribution of parents across occupational categories for Army, Marine Corps, and CPS groups. Consistent with the disparities in quartile distributions for MSEI and TSEI, Army and Marine Corps parents

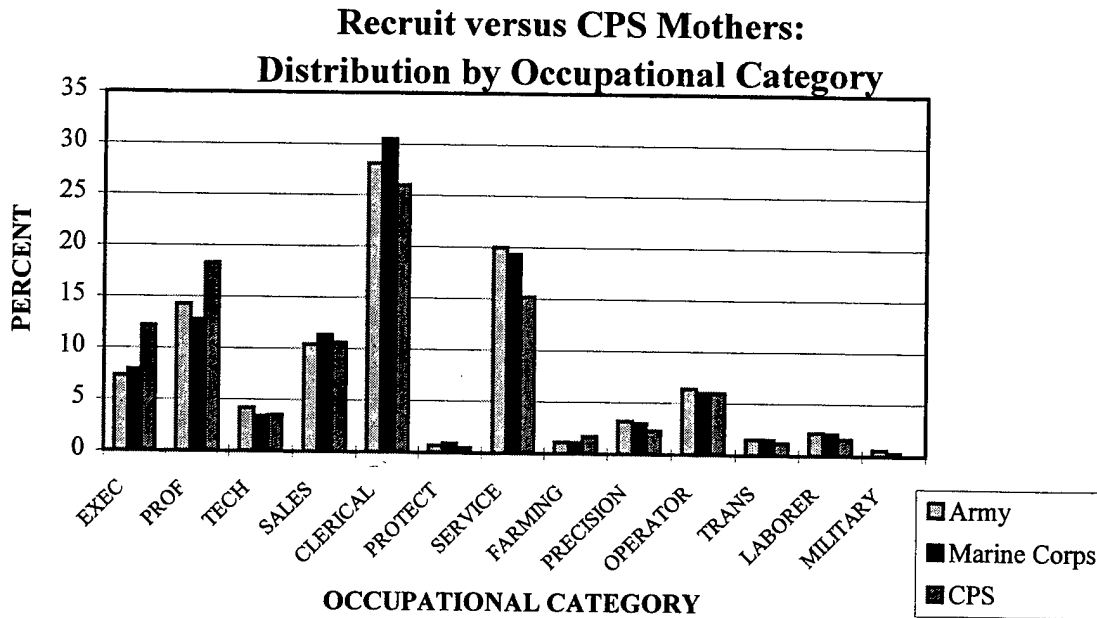
<sup>80</sup> Cooper (1977), Fredland and Little (1982), Fernandez (1989), and DoD's annual POPREP (1995) all find that military recruits come from slightly lower SES backgrounds than found in the general population.



Source: Derived from data provided by the Defense Manpower Data Center.

**Figure 4.3. Percentage Distributions by Occupational Category for Fathers of Army and Marine Corps Non-Prior Service, Active-Duty Recruits and 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

tend to be underrepresented in certain high-prestige occupational areas. For example, the percentages of Army and Marine Corps parents who are employed as executives and professionals are noticeably lower than those of CPS parents. Conversely, Army and Marine Corps parents are somewhat overrepresented in occupational categories that are typically classified as “blue collar,” such as clerical, service, and technical; and these differences are most visible for Army and Marine Corps fathers in precision, and for Army and Marine Corps mothers in clerical and service occupations.



Source: Derived from data provided by the Defense Manpower Data Center.

**Figure 4.4. Percentage Distributions by Occupational Category for Mothers of Army and Marine Corps Non-Prior Service, Active Duty Recruits and 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

Mean SES values and percentage distributions for parents' education and home ownership are compared for Army and Marine Corps recruits and the CPS sample in Tables 4.1 through 4.3, to further examine differences in SES representation.

Table 4.1 compares the mean values for each of the socioeconomic indicators used in this study, which include: MSEI, TSEI, father's and mother's education, and parental home ownership. As shown in Table 4.1, the relative size of the standard error for each of these variables is large. Therefore, the differences between the recruits' parental socioeconomic indicators and those of the CPS are considered statistically

insignificant. However, the trend clearly shows that recruits in both services are from a somewhat lower socioeconomic background than their counterparts in the CPS.

**Table 4.1. Comparison of Mean Socioeconomic Indices (MSEIs and TSEIs)<sup>a</sup>, Parental Education, and Parental Home Ownership for Fathers and Mothers of Army and Marine Corps Recruits<sup>b</sup> with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

SES Variables	ARMY	MARINE CORPS	CPS
<b>MSEI</b> (standard error)	35.85 (18.73)	35.80 (18.35)	40.23 (21.04)
<b>TSEI</b> (standard error)	33.97 (15.48)	34.10 (15.10)	38.05 (18.16)
<b>Father's Education<sup>c</sup></b> (standard error)	2.44 (1.03)	2.41 (1.03)	2.65 (1.03)
<b>Mother's Education<sup>c</sup></b> (standard error)	2.36 (0.97)	2.35 (0.97)	2.51 (0.97)
<b>Home Ownership<sup>d</sup></b> (standard error)	1.35 (0.56)	1.34 (0.55)	1.24 (0.46)

<sup>a</sup> MSEI represents the Male Socioeconomic Index, and TSEI represents the Total Socioeconomic Index. TSEI, by convention, is used to explain mother's socioeconomic background.

<sup>b</sup> Includes non-prior service, active-duty enlisted accessions from 1989 through 1995.

<sup>c</sup> For cross-tabulation analysis, parental education levels are assigned the following values: (1) for non-high school graduates, (2) for high school graduates, (3) for some college, and (4) for college graduates; then a simple average is computed.

<sup>d</sup> For cross-tabulation analysis, home ownership is assigned the following values: (1) for parents who own homes, (2) for parents who rent homes, and (3) for parents who pay neither rent nor mortgage; then a simple average is computed. A mean value that approaches "one" indicates that the parent is more likely to own a home. Since these values approximate the family's income, this study assumes that parents who own a home have the highest levels of income.

Source: Derived from data provided by the Defense Manpower Data Center.

## 2. Parents' Education

As previously noted, this study uses four levels of parental education: non-high school graduate, high school graduate, attended some college, and college graduate.

Table 4.1 shows that parents of Army and Marine Corps recruits have generally lower average levels of education than do CPS parents. For example, as seen here, Army and Marine Corps fathers have average education levels of 2.44 and 2.41, respectively, versus 2.65 for CPS fathers.

Table 4.2 compares the percentage distribution of education levels for Army, Marine Corps, and CPS mothers and fathers. For example, 20.4 percent and 21.6 percent of Army and Marine Corps fathers, respectively, are non-high school graduates, as

**Table 4.2. Percentage Distribution by Education Level for Fathers and Mothers of Army and Marine Corps Recruits\* and 18-to 24-Year-Olds in the 1995 Current Population Survey (CPS)**

EDUCATION LEVEL	FATHERS		
	ARMY	MARINE CORPS	CPS
Non-High School Graduate	20.4	21.6	14.9
High School Graduate	34.6	35.3	32.4
Some College	24.8	25.3	25.4
College Graduate	20.2	19.8	27.3
Total	100.0	100.0	100.0
EDUCATION LEVEL	MOTHERS		
	ARMY	MARINE CORPS	CPS
Non-High School Graduate	19.5	20.1	15.4
High School Graduate	39.1	40.2	37.3
Some College	26.0	24.4	27.9
College Graduate	15.4	15.3	19.4
Total	100.0	100.0	100.0

\* Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

compared with 14.9 percent of CPS fathers. The results in Table 4.2 indicate that differences in the mean values are influenced by differences in the lowest and highest categories of education. In other words, parents of Army and Marine Corps recruits are more likely to be non-high school graduates than CPS parents, and they are less likely to be college graduates.

### **3. Parents' Home Ownership**

Home ownership is used as a proxy for parental income in this study. Mean values in Table 4.1 indicate that parents of Army and Marine Corps recruits are less likely to own a home than are CPS parents and more likely to "pay neither rent nor mortgage." As such, recruits' parents in both services are assumed to have lower average incomes than do their civilian counterparts. Table 4.3 shows the percentage distributions of home ownership variables for Army, Marine Corps, and CPS parents. For example, approximately 77 percent of Army and Marine Corps recruit fathers own their homes, as compared with 82.8 percent of CPS fathers. Similar to the distributions of parents' occupational categories and education levels, recruits' parents are slightly under-represented as homeowners in the highest category and overrepresented among those who pay neither rent nor mortgage.

This study reveals a noteworthy trend in differences between the SES background characteristics of Army and Marine Corps recruits and the CPS sample. The Army and Marine Corps recruits have lower mean values for all of the SES variables, reflected in

**Table 4.3. Percentage Distribution by Home Ownership for Fathers and Mothers of Army and Marine Corps Recruits\* and 18-to 24-Year-Olds in the 1995 Current Population Survey (CPS)**

<b>FATHERS</b>			
<b>HOME OWNERSHIP</b>	<b>ARMY</b>	<b>MARINE CORPS</b>	<b>CPS</b>
<b>Own</b>	77.1	77.3	82.7
<b>Rent</b>	18.5	18.7	16.1
<b>Occupied/No Rent</b>	4.5	4.0	1.2
<b>Total</b>	100.0	100.0	100.0
<b>MOTHERS</b>			
<b>Own</b>	71.0	71.4	75.4
<b>Rent</b>	24.4	24.5	23.3
<b>Occupied/No Rent</b>	4.54	4.1	1.3
<b>Total</b>	100.0	100.0	100.0

\* Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

fairly consistent differences between the distributions of both samples by SES-related characteristics. Parents of recruits in both services tend to be underrepresented in the “highest” categories of occupation, education, and home ownership and overrepresented in the “lowest” categories. For example, parents of Army and Marine Corps recruits are *more* likely than their CPS counterparts to be non-high school graduates, work in clerical or service occupations, and neither rent nor own their homes; and they are *less* likely than CPS parents to be college graduates, work as professionals or executives, and own their own homes.

#### 4. Family Status

Family status is divided into single-parent and dual-parent households. Table 4.4 compares the family background of Army and Marine Corps recruits with that of 18-to 24-year-olds from the CPS. For instance, as seen here, almost twice as many recruit families in the Army and Marine Corps are headed by single mothers, as compared with CPS families; and, as a whole, recruits in both services are less likely than their civilian counterparts to come from dual-parent households. This may account for some of the variation in SES background between the survey sample and the CPS, since mothers generally have lower levels of occupational prestige and education than fathers.

**Table 4.4. Percentage Distribution by Family Status for Army and Marine Corps Recruits\* and 18-to 24-Year-Olds in the 1995 Current Population Survey (CPS)**

<b>FAMILY STATUS</b>	<b>ARMY</b>	<b>MARINE CORPS</b>	<b>CPS</b>
<b>Dual-Parent Household</b>	69.3	69.7	84.5
<b>Single-Parent Household (Mother)</b>	23.8	23.0	12.1
<b>Single-Parent Household (Father)</b>	7.0	7.3	3.4
<b>Total</b>	100.0	100.0	100.0

\* Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

Additionally, single-parent households denote lower levels of SES due to loss of parental income and time spent at home.



In the following section, several factors are examined that may explain why Army and Marine Corps recruits come from slightly lower SES backgrounds than do their civilian counterparts.

### **C. EXPLAINING DIFFERENCES IN SES REPRESENTATION**

The authors of this study expected that several factors may help to explain differences between the SES background of recruits and that of their CPS counterparts to include: race/ethnicity, region, gender, the omission of officers from the survey data, and recruits' reasons for joining the military. Each of these factors is addressed below:

#### **1. Race/Ethnicity**

This section examines whether observed differences in SES backgrounds are linked to the overrepresentation of blacks in the military services. The findings reveal that, although black enlistees come from a lower SES background than do white enlistees, only small differences exist between the SES background of black enlistees and that of their CPS counterparts.

Race/ethnicity is divided into white, black, Hispanic, and other minorities to compare Army and Marine Corps data with the CPS. Table 4.5 shows the distribution of race/ethnicity in the Army, Marine Corps, and general population. For example, 18.7 percent and 13.3 percent of Army and Marine Corps recruits, respectively, are black, compared with 11.5 percent of the 18-to 24-year olds from the CPS. As compared with the CPS, the Marine Corps has proportionately fewer white enlistees and proportionately

more black and Hispanic enlistees. For the Army, there is a slightly higher percentage of black enlistees and a smaller proportion of white and Hispanic enlistees.

**Table 4.5. Percentage Distribution by Race/Ethnicity for Army and Marine Corps Recruits\* and 18-to 24-Year-Olds in the 1995 Current Population Survey (CPS)**

<b>RACE/ ETHNICITY</b>	<b>ARMY</b>	<b>MARINE CORPS</b>	<b>CPS</b>
<b>White</b>	71.2	72.9	76.3
<b>Black</b>	18.7	13.3	11.5
<b>Hispanic</b>	6.7	10.2	8.0
<b>Other Minorities</b>	3.4	3.6	4.2
<b>Total</b>	100.0	100.0	100.0

\* Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

Tables 4.6 and 4.7 compare the mean SES index of each racial/ethnic group for both Army and Marine Corps samples with its CPS counterpart. These tables help to explain some of the difference between the parental SES of Army and Marine Corps recruits and that of the CPS. From these tables, two major findings emerge. First, the Army and Marine Corps generally recruit young people from a socioeconomic level that is below the average for the general population. Of the differences between the overall service and CPS means, most of the variation is explained by the differences between white enlistees for the service sample and their counterparts in the CPS. A much smaller portion of the variation is explained by differences in the other minority category, whose members comprise a relatively small percentage of the service and civilian populations. Second, the comparative difference between black recruits from both services and their

counterparts in the civilian population appears minimal and does not explain the overall mean SES indices.

One particularly interesting finding here is that the military appears to recruit Hispanics from a higher SES level than that of their civilian counterparts. Hispanics comprise a relatively small proportion of Army and Marine Corps recruits (about 7 percent and 10 percent, respectively, from Table 4.5); but this particular trend generally runs counter to other military-civilian relationships found in this study.

**Table 4.6. Comparison of Mean Male Socioeconomic Indices (MSEIs), by Race/Ethnicity, for Fathers of Army and Marine Corps Recruits<sup>a</sup> with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

	OVERALL MEAN	WHITE	BLACK	HISPANIC	OTHER
<b>ARMY</b>	35.85	36.99	32.21	30.87	36.14
<b>CPS</b>	40.23	42.96	32.59	28.41	43.05
$\Delta^b$	-4.38	-5.97	-0.38	+2.46	-6.91
<b>MARINE CORPS</b>	35.80	36.97	31.82	30.02	35.22
<b>CPS</b>	40.23	42.96	32.59	28.41	43.05
$\Delta^b$	-4.43	-5.99	-0.77	+1.61	-7.83

<sup>a</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

<sup>b</sup> Delta ( $\Delta$ ) represents the difference between the mean MSEI for each service and CPS data. A negative (-) indicates the service mean is smaller than the CPS mean, while a positive (+) indicates that the service mean is greater than the CPS mean.

Source: Derived from data provided by the Defense Manpower Data Center.

**Table 4.7. Comparison of Mean Total Socioeconomic Indices (TSEIs), by Race/Ethnicity, for Mothers of Army and Marine Corps Recruits<sup>a</sup> with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

	OVERALL MEAN	WHITE	BLACK	HISPANIC	OTHER
<b>ARMY</b>	33.97	34.95	32.38	30.28	32.84
<b>CPS</b>	38.05	40.05	33.55	30.89	36.39
$\Delta^b$	-4.08	-5.10	-1.17	-0.61	-3.55
<b>MARINE CORPS</b>	34.10	34.71	33.39	29.86	33.09
<b>CPS</b>	38.05	40.05	33.55	30.29	36.38
$\Delta^b$	-3.95	-5.34	-0.16	-0.43	-3.29

<sup>a</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

<sup>b</sup> Delta ( $\Delta$ ) represents the difference between the mean MSEI for each service and CPS data. A negative (-) indicates the service mean is smaller than the CPS mean, while a positive (+) indicates that the service mean is greater than the CPS mean.

Source: Derived from data provided by the Defense Manpower Data Center.

## 2. Region

Persons from the Southern regions of the U. S. generally have lower measures of SES than do those from other regions.<sup>81</sup> This section examines whether patterns in the regional representation of recruits may affect observed differences in SES between the Army and Marine Corps and the CPS sample.

In this study, region is divided into four census groups: Northeast, North Central, South, and West. Table 4.8 shows the percentage distribution by census regions of Army and Marine Corps recruits and 18-to 24-year-olds in the 1995 CPS. As seen here, both

<sup>81</sup> U. S. Bureau of the Census, *Statistical Abstract of the United States: 1990 (110<sup>th</sup> Edition)*, Washington, DC, 1990.

services recruit a disproportionately large number of enlistees from the Southern census region--approximately 43 and 37 percent in the Army and Marine Corps, respectively, compared with 30 percent in the CPS.

**Table 4.8. Percentage Distribution, by Census Region, of Army and Marine Corps Recruits\* and 18-to 24-Year-Olds in the 1995 Current Population Survey (CPS)**

REGION	ARMY	MARINE CORPS	CPS
Northeast	15.0	13.2	23.7
North Central	22.8	25.8	25.1
South	42.8	37.1	30.1
West	19.4	23.9	21.1
Total	100.0	100.0	100.0

\*Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

Table 4.9 compares the mean SES indices by census region for Army and Marine Corps recruits with those of the general population. Two trends are evident: first, both the Army and Marine Corps generally recruit lower SES personnel from all census regions; and, second, within the services, recruits from the North Central and Southern regions have lower SES indices than their respective service means. These regions, together, account for over 60 percent of recruits in the Army and Marine Corps. Both of these findings may help to explain some of the differences in the SES indices between the military and civilian populations.

**Table 4.9. Comparison of Mean Socioeconomic Indices (MSEIs and TSEIs)<sup>a</sup>, by Census Region, for Army and Marine Corps Recruits<sup>b</sup> with 18-to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

REGION	MSEI			TSEI		
	ARMY	USMC	CPS	ARMY	USMC	CPS
Northeast	36.48	35.19	42.04	34.27	33.38	38.98
North Central	34.21	34.88	39.63	33.08	33.51	37.82
South	35.52	35.75	39.71	33.64	34.05	37.61
West	37.83	37.16	39.72	35.42	35.27	37.97
Service and CPS Mean SES Index	35.85	35.80	40.23	33.97	34.10	38.06

<sup>a</sup> MSEI represents the Male Socioeconomic Index, and TSEI represents the Total Socioeconomic Index. TSEI, by convention, is used to explain mother's socioeconomic background.

<sup>b</sup> Includes non-prior service, active-duty enlisted accessions from 1989 through 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

### **3. Gender**

This section examines whether female recruits come from lower SES backgrounds than do male recruits. Table 4.10 compares the mean SES indices of male and female recruits with those of 18-to 24-year-olds from the 1995 CPS, along with comparative measures of father's education, mother's education, and home ownership.

The findings reveal that female Army and Marine Corps recruits generally come from lower SES backgrounds than do their male and CPS counterparts. However, the differences between the SES backgrounds of male and female recruits do not explain the overall differences between the military and civilian samples with respect to SES for several reasons. First, the proportion of women in both services is relatively small--about 16 percent and 5 percent in the Army and Marine Corps, respectively. Second, as seen in

Table 4.10, the standard errors are much larger than the mean differences in SES characteristics between male and female recruits for both services and their counterparts from the CPS. And, finally, the military sample appears to be relatively homogeneous regardless of gender. Thus, the data, as seen here, support previous findings, but do not explain differences in SES representation.

**Table 4.10. Comparison of Mean Socioeconomic Indices (MSEIs and TSEIs)<sup>a</sup>, Parental Education, and Parental Home Ownership, by Gender, for Army and Marine Corps Recruits<sup>b</sup> with 18- to 24-Year-Olds from the Current Population Survey (CPS)**

SES Characteristics	ARMY		MARINE CORPS		CPS MEAN
	Male	Female	Male	Female	
MSEI (standard error)	36.07 (18.73)	34.08 (18.66)	35.85 (18.33)	34.77 (18.63)	40.23 (21.04)
TSEI (standard error)	34.22 (15.88)	32.35 (14.77)	34.10 (15.10)	34.02 (15.15)	38.05 (18.16)
Father's Education (standard error)	2.45 (1.03)	2.34 (1.04)	2.41 (1.03)	2.41 (1.03)	2.65 (1.03)
Mother's Education (standard error)	2.37 (0.97)	2.27 (0.97)	2.35 (0.97)	2.40 (0.99)	2.51 (0.97)
Home Ownership (standard error)	1.34 (0.56)	1.37 (0.57)	1.33 (0.55)	1.38 (0.55)	1.24 (0.46)

<sup>a</sup> MSEI represents the Male Socioeconomic Index, and TSEI represents the Total Socioeconomic Index. TSEI, by convention, is used to explain mother's socioeconomic background.

<sup>b</sup> Includes non-prior service, active-duty enlisted accessions from 1989 through 1995.

Source: Derived from data provided by the Defense Manpower Data Center.

#### 4. Omission of Officers

The 1995 edition of DoD's annual POPREP suggests that military officers come from higher SES backgrounds than do enlisted personnel. This section examines whether the inclusion of officer accessions would eliminate differences in SES representation between the Army and Marine Corps and the CPS samples.

In an effort to determine the accuracy of the hypothesis stated above, a simple quantitative approach is used to account for differences based on the omission of officers in the service sample. Table 4.11 shows the calculations involved in determining the effects of adding officers to the Army and Marine Corps samples.

**Table 4.11. Computation of the Ratio of Socioeconomic Indices (MSEIs and TSEIs)\* for Army and Marine Corps Enlistees and Officers to 18- to 24-Year-Olds from the 1995 Current Population Survey (CPS)**

Army =	$\frac{(\alpha_E)MSEI_E + (\alpha_o)MSEI_o}{MSEI_C} = \frac{(.93)(35.85) + (.07)(49.06)}{40.23} = 0.914$
Army =	$\frac{(\alpha_E)TSEI_E + (\alpha_o)TSEI_o}{TSEI_C} = \frac{(.93)(34.27) + (.07)(46.93)}{38.05} = 0.924$
Marine Corps =	$\frac{(\alpha_E)MSEI_E + (\alpha_o)MSEI_o}{MSEI_C} = \frac{(.96)(35.80) + (.04)(49.06)}{40.23} = 0.903$
Marine Corps =	$\frac{(\alpha_E)TSEI_E + (\alpha_o)TSEI_o}{TSEI_C} = \frac{(.96)(34.10) + (.04)(46.93)}{38.05} = 0.910$

\*MSEI represents the Male Socioeconomic Index, and TSEI represents the Total Socioeconomic Index. TSEI, by convention, is used to explain mother's socioeconomic background.

Source: Derived from data provided by the Defense Manpower Data Center.



Table 4.11 uses a ratio composed of enlistee and officer mean SES indices over the civilian population mean SES index to estimate the effects of including officers in the samples. As seen in the equations,  $\alpha_O$  and  $\alpha_E$  represent the proportions of officers and enlistees.  $MSEI_E$  and  $TSEI_E$  represent the mean indices for fathers and mothers of enlisted military members.  $MSEI_C$  and  $TSEI_C$  represent the mean SES indices for fathers and mothers of the civilian population. And  $MSEI_O$  and  $TSEI_O$  represent the military officer's SES index. Although this value is not explicitly known, it can be estimated using MSEI and TSEI values from the mean CPS indices. This study assumes that the average officer typically comes from a household in which the parent's highest education level is either some college or college graduate or higher.

As seen in Table 4.11, ratios of less than one indicate that including officers in the pool of Army and Marine Corps personnel does explain some of the differences in SES representation between the military and civilian samples. Therefore, while the inclusion of officers increases the mean SES values of the service samples, the effects are relatively small because of the small proportion of officers in both services (7 and 4 percent in the Army and Marine Corps, respectively).

## **5. Reasons for Joining the Military**

Persons join the military for a variety of reasons. Some of the more important reasons include: employment opportunities, educational benefits, retirement benefits, patriotism, leadership enhancement, and family tradition. This section examines whether reasons for joining the military differ by SES characteristics.

The authors hypothesize that SES backgrounds may be lower for the military, because a large proportion of recruits join the military to gain educational benefits. Among the SES survey respondents, more than 50 percent of the recruits from both services selected educational benefits as their primary reason for joining the military. The remaining 50 percent of recruit responses were dispersed over 13 other reasons for joining the military, resulting in distributions too small to provide any detailed information regarding SES characteristics. Table 4.12 shows that mean SES indices for recruits who joined the military to obtain money for college education is generally higher than mean SES indices for the samples as a whole, and that only slight differences exist.

**Table 4.12. Comparison of Mean Socioeconomic Indices (MSEIs and TSEIs)<sup>a</sup>, by Reason for Joining the Military (Educational Benefits), for Army and Marine Corps Recruits<sup>b</sup>**

	MSEI		TSEI	
	ARMY	MARINE CORPS	ARMY	MARINE CORPS
<b>Educational Benefits</b>	36.05	36.25	33.75	34.25
<b>Service Mean</b>	35.85	35.80	33.97	34.10
<b>Δ<sup>c</sup></b>	+0.20	+0.45	-0.22	+0.15

<sup>a</sup> MSEI represents the Male Socioeconomic Index, and TSEI represents the Total Socioeconomic Index. TSEI, by convention, is used to explain mother's socioeconomic background.

<sup>b</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1995.

<sup>c</sup> Delta (Δ) represents the difference between the mean service SES Index and the mean SES Index for recruits who joined for educational benefits. A negative (-) indicates that the mean SES Index for those who selected educational benefits as a reason for joining is smaller than the individual service mean and positive (+) indicates that the individual service mean is smaller than the mean SES Index for recruits who chose educational benefits as a reason for joining the military.

Source: Derived from data provided by the Defense Manpower Data Center.

Therefore, the fact that a majority of recruits join the military for its educational benefits does not help to explain differences in SES representation between the military and civilian samples.

## D. LOGIT MODEL RESULTS

As previously discussed in Chapter III, logistic regression models were selected to determine the effects of SES on first-term attrition and Marine Corps water survival qualifications and awards. This section reviews the model variables, presents logit model results, and discusses three “typical” cases to explain the effects of SES on each of these performance measures.

### 1. First-Term Attrition Model

The following logit models were used to estimate the effects of SES and service member characteristics on first-term attrition. The models used are provided in Table 4.13 below, and the variables used in each model are explained in detail in Chapter III.

**Table 4.13. Logistic Multivariate Regression Models for First-Term Attrition**

Behavioral and Performance-Related Attrition (Attrition 1):

$$ATT1 = f(PSEI \ PSEI\_NV \ P\_NHSD \ P\_SCOLL \ P\_COLL \ OWN \ NOPAY \ SPHH \ S\_DIST \ NC\_DIST \ W\_DIST \ BLACK \ HISPAN \ OTHMIN \ AGE)$$

Non-Behavioral Attrition (Attrition 2):

$$ATT2 = f(PSEI \ PSEI\_NV \ P\_NHSD \ P\_SCOLL \ P\_COLL \ OWN \ NOPAY \ SPHH \ S\_DIST \ NC\_DIST \ W\_DIST \ BLACK \ HISPAN \ OTHMIN \ AGE)$$

Overall First-Term Attrition (Attrition 3):

$$ATT3 = f(PSEI \ PSEI\_NV \ P\_NHSD \ P\_SCOLL \ P\_COLL \ OWN \ NOPAY \ SPHH \ S\_DIST \ NC\_DIST \ W\_DIST \ BLACK \ HISPAN \ OTHMIN \ AGE)$$

Overall first-term attrition is addressed in this section, while both behavioral-specific and non-behavioral-specific first-term attrition results are included in Appendix E. The Attrition 3 Logit model (ATT3) was used to determine whether SES indicators--parental socioeconomic index, parental education, and parental homeownership--are related to a service member's likelihood of receiving either a behavioral or non-behavioral discharge prior to completion of his or her initial term of enlistment. A synopsis of the results of this logistic analysis are contained in Table 4.14, while Appendix E contains comprehensive logistic regression results.

**Table 4.14. First-Term Overall Attrition (ATT3) Logit Model Coefficient Estimates and Marginal Effects for Army and Marine Corps Recruits\***

	ARMY		USMC	
INDEPENDENT VARIABLE	ATT3	MARGINAL EFFECTS	ATT3	MARGINAL EFFECTS
<b>Parents Highest SES Index</b>				
PSEI	0.0019	0.951	-0.0009	-0.443
PSEI_NV	0.2954 <sup>1</sup>	7.199	0.1105	2.662
<b>Parents Highest Education</b>				
P_NHSD	0.0778	1.863	0.1056	2.543
P_SCOLL	-0.0464	-1.096	-0.0345	-0.818
P_COLL	-0.0646	-1.522	-0.0152	-0.361
<b>Homeownership</b>				
OWN	-0.1060 <sup>3</sup>	-2.483	-0.0288	-0.685
NOPAY	-0.1630	-3.790	0.0521	1.248
<b>Census District</b>				
NC_DIST	0.0165	0.393	-0.0534	-1.266
S_DIST	0.0626	1.496	-0.0951	-2.242
W_DIST	-0.0555	-1.310	-0.1782 <sup>2</sup>	-4.156

**Table 4.14 (Continued)**

	ARMY		USMC	
INDEPENDENT VARIABLE	ATT3	MARGINAL EFFECTS	ATT3	MARGINAL EFFECTS
<b>Race/Ethnicity</b>				
BLACK	-0.0049	-0.116	0.1383 <sup>2</sup>	3.342
HISPAN	-0.5250 <sup>1</sup>	-11.519	-0.5110 <sup>1</sup>	-11.31
OTHMIN	0.0308	0.734	-0.2356 <sup>3</sup>	-5.45
<b>Enlistee Age</b>				
AGE	0.0275 <sup>1</sup>	1.316	0.0569 <sup>1</sup>	2.742
<b>Family Status</b>				
Single Parent Household (SPHH)	0.1073 <sup>3</sup>	2.576	-0.0072	-0.171

\*Includes active-duty non-prior service enlisted accessions from 1989 to 1991.

Key:

<sup>1</sup> Significant at the .01 level

<sup>2</sup> Significant at the .05 level

<sup>3</sup> Significant at the .10 level

Source: Derived from data provided by the Defense Manpower Data Center.

Analysis of the ATT3 model reveals that there is a relatively weak relationship between SES and overall first-term enlisted attrition. Of the variables used to describe SES, race/ethnicity and home ownership are the only two significant variables. As previously stated, home ownership is used as a proxy for income in this study. Therefore the ATT3 model reveals that recruits from higher-income families are more likely to complete their first term of enlistment. Additionally, the model reveals mixed results with respect to first-term attrition for black and other minority recruits, while Hispanic recruits are consistently less likely to be discharged prior to completion of their first term

of enlistment. These results show that SES indicators--PSEI and parents' highest level of education--are relatively weak predictors of first-term attrition in the military.

*a. "Typical" Cases*

To better understand the relationship between these models, three "typical" cases are presented to explain the relationship between SES indicators and first-term attrition. The first case is a notional enlistee whose parents' highest level of education is no high school diploma, and whose SES index and home ownership is represented by the mean for parents who are non-high school graduates. The second and third cases follow the same logic but count parents' highest level of education as high school graduate and college graduate, respectively.

Table 4.15 illustrates the differences in probability of overall first-term attrition based on each of the "typical" cases discussed above. Based on overall attrition (ATT3), Army enlistees whose parents are non-high school graduates are 1.8 percent more likely to be discharged prior to completion of their first term of enlistment than are enlistees whose parents' highest level of education is high school graduate. This analysis holds true for overall attrition within the Marine Corps as well. Additionally, Table 4.15 shows that Army enlistees whose parents are college graduates are 0.80 percent less likely to be discharged prior to completion of their first-term of enlistment than are enlistees whose parents' highest level of education is high school graduate. This finding supports the hypothesized relationship discussed in Chapter III, which states that the likelihood of first-term attrition would decrease as the recruit's parental education

increases. As seen here, the differences between “typical” recruits are relatively small and insignificant, which again supports the finding that SES background is not a strong predictor of first-term attrition.

**Table 4.15. Comparison of Marginal Effects Analysis for Overall First-Term Attrition (ATT3) using Three “Typical” Army and Marine Corps Recruit<sup>a</sup> SES Backgrounds**

Dependent Variable	Case 1 (NHSD) <sup>c</sup>	$\Delta^b$	Case 2 (HSD) <sup>c</sup>	$\Delta^b$	Case 3 (ColGrad) <sup>c</sup>
	ARMY				
ATT3	37.9	-1.8	36.1	-0.80	35.3
	MARINE CORPS				
ATT3	41.6	-2.8	38.8	-0.80	38.0

<sup>a</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1991.

<sup>b</sup> Delta ( $\Delta$ ) represents the percentage difference in the overall first-term attrition between Case 1 and Case 3 as compared with Case 2.

<sup>c</sup> These represent the parents’ highest level of education in a recruit’s household. NHSD, HSD, and ColGrad stand for non-high school diploma, high school diploma and college graduate, respectively.

Source: Derived from data provided by the Defense Manpower Data Center.

## 2. Marine Corps Water Survival Qualification and Awards Models

The following logit models were used to estimate the relationships between SES background characteristics of Marine recruits and the likelihood of “successful” outcomes for both water survival qualifications and awards as measures of performance. The models used are provided in Table 4.16 below, and the variables used in each model are explained in Chapter III.

Logit models WATER\_QL and AWARD were used to determine whether SES indicators--parental socioeconomic index, parental education, and parental homeowner-ship--are related to a service member’s likelihood of “successful” outcomes on these two

**Table 4.16. Logistic Multivariate Regression Models for Water Survival Qualification and Awards**

Water Survival Qualification:

$$\text{WATER\_QL} = f(\text{PSEI PSEI\_NV P\_NHSD P\_SCOLL P\_COLL OWN NOPAY SPHH S\_DIST NC\_DIST W\_DIST BLACK HISPAN OTHMIN AGE})$$

Awards:

$$\text{AWARD} = f(\text{PSEI PSEI\_NV P\_NHSD P\_SCOLL P\_COLL OWN NOPAY SPHH S\_DIST NC\_DIST W\_DIST BLACK HISPAN OTHMIN AGE})$$

Marine Corps performance measures. For water survival qualifications, “success” is defined as a second class qualification and above, while “failure” is defined as a third class qualification and below. For awards, “success” is defined as the receipt of one or more awards, while “failure” is defined as no awards. A synopsis of the results of this logistic analysis is contained in Table 4.17, while Appendix F contains the comprehensive logistic regression results.

Analysis of the WATER\_QL model in Table 4.17 shows that there is a relatively strong relationship between SES and "successful" performance as measured by water survival qualification. Of the 15 variables used to describe SES, home ownership and recruit's age are the only two insignificant variables. The model indicates that recruits from higher SES backgrounds, whose parents have higher levels of occupation and education, are more likely to qualify as second class swimmers and above. Other notable findings include the relationship between race/ethnicity and the likelihood of “successful”



**Table 4.17. Water Survival Qualification and Awards Logit Model  
Coefficient Estimates and Marginal Effects for Marine  
Corps Recruits\***

INDEPENDENT VARIABLE	SWIM QUAL	MARGINAL EFFECTS	AWARDS	MARGINAL EFFECTS
<b>Parents Highest SES Index</b>				
PSEI	0.0051 <sup>1</sup>	1.626	0.0001	0.010
PSEI_NV	0.2140 <sup>1</sup>	3.890	-0.0209	-0.207
<b>Parents Highest Education</b>				
P_NHSD	-0.1064 <sup>3</sup>	-1.771	-0.0069	-0.068
P_SCOLL	0.2328 <sup>1</sup>	4.252	-0.2962 <sup>1</sup>	-2.632
P_COLL	0.3240 <sup>1</sup>	6.055	-0.2204 <sup>1</sup>	-2.017
<b>Homeownership</b>				
OWN	0.0370	0.641	-0.1156 <sup>2</sup>	-1.101
NOPAY	0.1504 <sup>3</sup>	2.689	-0.2095	-1.925
<b>Census District</b>				
NC_DIST	0.8398 <sup>1</sup>	17.507	0.0199	0.201
S_DIST	0.3129 <sup>1</sup>	5.832	-0.1545 <sup>2</sup>	-1.451
W_DIST	1.0547 <sup>1</sup>	22.741	-0.0255	-0.251
<b>Race/Ethnicity</b>				
BLACK	-1.5428 <sup>1</sup>	-16.307	0.0738	0.757
HISPAN	-0.1940 <sup>1</sup>	-3.153	0.1065	1.107
OTHMIN	-0.5779 <sup>1</sup>	-8.334	0.0565	0.576
<b>Enlistee Age</b>				
AGE	-0.0104	-0.178	0.0571 <sup>1</sup>	0.582
<b>Family Status</b>				
Single Parent Household (SPHH)	0.1089 <sup>1</sup>	1.925	0.0230	0.232

\*Includes active-duty non-prior service enlisted accessions from 1989 to 1991.

Key:

<sup>1</sup> Significant at the .01 level

<sup>2</sup> Significant at the .05 level

<sup>3</sup> Significant at the .10 level

Source: Derived from data provided by the Defense Manpower Data Center.

performance. For example, black, Hispanic, and "other minority" recruits are less likely than white recruits to qualify as second class swimmers and above. The results of the WATER\_QL model support the hypothesized relationships outlined in Chapter III that SES is positively correlated with "successful" performance.

Analysis of the AWARD model in Table 4.17 reveals that there is a relatively weak relationship between SES and "successful" performance as measured by personal awards. Of the 15 explanatory variables used in the model, only five are statistically significant. The model indicates that as a recruit gets older, he or she is more likely to receive an award and that recruits from the South are less likely to receive an award in the Marine Corps. A more surprising finding shows that recruits whose parents own homes and have higher levels of education are less likely to receive awards.

*a. "Typical" Cases*

To better understand the relationships in these model, three "typical" cases are presented to explain the relationship between SES indicators and "successful" performance as measured by both Marine Corps water survival qualification and awards.<sup>82</sup>

(1) **Water Survival Qualification.** Table 4.18 illustrates the differences in probability of "successful" performance on Marine Corps water survival qualifications based on each of the "typical" cases discussed above. As seen here, Marine Corps enlistees whose parents are non-high school graduates are 2.0 percent less likely to

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<sup>82</sup> "Typical" cases are defined the same way as they were for first-term enlisted attrition in this study.

qualify as second class swimmers and above than enlistees whose parents are high school graduates. Additionally, Marine Corps enlistees whose parents are college graduates are 8.0 percent more likely to qualify as second class swimmers and above than enlistees whose parents are high school graduates. These effects are relatively large when comparing “typical” cases for other measures of performance used in this study.

**Table 4.18. Comparison of Marginal Effects Analysis for Water Survival Qualification and Awards using Three “Typical” Marine Corps Recruit<sup>a</sup> SES Backgrounds**

Dependent Variable	Case 1 (NHSD) <sup>c</sup>	$\Delta^b$	Case 2 (HSD) <sup>c</sup>	$\Delta^b$	Case 3 (ColGrad) <sup>c</sup>
	WATER SURVIVAL QUALIFICATION				
WATER_QL	20.0	+2.0	22.0	+8.0	30.0
AWARD	AWARDS				
	11.0	-1.0	10.0	-2.0	8.0

<sup>a</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1991.

<sup>b</sup> Delta ( $\Delta$ ) represents the percentage difference in the likelihood of successful performance between Case 1 and Case 3 as compared with Case 2.

<sup>c</sup> These represent the parents’ highest level of education in a recruit’s household. NHSD, HSD, and ColGrad stand for non-high school diploma, high school diploma and college graduate, respectively.

Source: Derived from data provided by the Defense Manpower Data Center.

(2) **Awards.** The differences between the same three “typical” cases are significantly smaller when examining the relationship between SES indicators and “successful” performance as measured by receipt of a personal award. Table 4.18 above indicates that Marine Corps enlistees whose parents are non-high school graduates are 1.0 percent more likely to receive an award than enlistees whose parents are high school graduates. Additionally, Marine Corps enlistees whose parents are college

graduates are 2.0 percent less likely to receive an award than enlistees whose parents are high school graduates. These findings are contrary to the hypothesized relationship discussed in Chapter III, which states that the likelihood of receiving an award would increase as the recruit's parental education increases.

## **E. OLS MODEL RESULTS**

As previously discussed in Chapter III, ordinary least squares (OLS) regression models were selected to determine the relationship between SES and Marine Corps rifle marksmanship and PFT scores. This section reviews the model variables, presents OLS model results, and discusses three "typical" cases to explain the relationship between SES and each of these performance measures.

### **1. Marine Corps Rifle Marksmanship and PFT Models**

The following OLS models were used to estimate the relationships between the SES background characteristics of Marine recruits and rifle marksmanship and PFT scores as measures of performance. The models used are provided in Table 4.19 below, and the variables used in each model are explained in Chapter III.

OLS models R\_SCORE and PFT\_SCOR were used to determine whether SES indicators--parental socioeconomic index, parental education, and parental home-ownership--are related to a service member's performance on the Marine Corps rifle marksmanship and physical fitness tests.

**Table 4.19. Ordinary Least Squares Regression Models**

Rifle Marksmanship Score:

$$R\_SCORE = f(PSEI\ PSEI\_NV\ P\_NHSD\ P\_SCOLL\ P\_COLL\ OWN\ NOPAY\ SPHH\ S\_DIST\ NC\_DIST\ W\_DIST\ BLACK\ HISPAN\ OTHMIN\ AGE)$$

Physical Fitness Test Score:

$$PFT\_SCOR = f(PSEI\ PSEI\_NV\ P\_NHSD\ P\_SCOLL\ P\_COLL\ OWN\ NOPAY\ SPHH\ S\_DIST\ NC\_DIST\ W\_DIST\ BLACK\ HISPAN\ OTHMIN\ AGE)$$

Results of the R\_SCORE model in Table 4.20 show that of the SES indicators, PSEI and home ownership are statistically significant. However, a one-unit change in PSEI results in only a negligible change in rifle score. For instance, an increase in 10 points in PSEI results in a 0.19 point increase in rifle score.<sup>83</sup> Other significant variables that have a stronger relationship with rifle score than those noted for PSEI and home ownership include census districts, black, Hispanic, and age. As seen here, the strongest relationship is observed for black Marines who, on average, score 5.7 points lower with the rifle than white Marines.

Results of the PFT\_SCOR model in Table 4.21 show that of the SES indicators, the variable, parents are college graduates, is statistically significant. For example, a recruit whose parents are college graduates will score 2.3 points higher on a PFT than a recruit whose parents are high school graduates. Similar to the R\_SCORE model, the variables for census districts, black, Hispanic, and age are all significant at the one percent level and have relatively strong effects on PFT scores. However, in this case, black and Hispanic Marines score higher on the PFT than white Marines.

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<sup>83</sup> As stated previously in Chapter III, Marine Corps data for rifle scores were received in intervals of ten. Therefore, in order to interpret the effects of each of the explanatory variables on performance correctly, the authors multiply the parameter estimates by ten.

**Table 4.20. Results of Ordinary Least Squares (OLS) Marine Corps Rifle Marksmanship Score (R\_SCORE) Model**

<b>INDEPENDENT VARIABLE</b>	<b>Parameter Estimate*</b>	<b>Standard Error</b>	<b>T for HO: Para = 0</b>	<b>Prob &gt; T</b>
<b>Parents Highest SES Index</b>				
PSEI	0.0019	0.0008	2.421	0.0155
PSEI_NV	-0.0662	0.0453	-1.461	0.1440
<b>Parents Highest Education</b>				
P_NHSD	0.0071	0.0380	0.187	0.8520
P_SCOLL	0.0415	0.0294	1.411	0.1583
P_COLL	0.0532	0.0337	1.578	0.1146
<b>Home Ownership</b>				
OWN	0.0888	0.0285	3.117	0.0018
NOPAY	-0.0864	0.0638	-1.355	0.1756
<b>Census District</b>				
NC_DIST	0.1611	0.0391	4.117	0.0001
S_DIST	0.1656	0.0403	4.113	0.0001
W_DIST	0.2938	0.0424	6.931	0.0001
<b>Race/Ethnicity</b>				
BLACK	-0.5686	0.0345	-16.469	0.0001
HISPAN	-0.1461	0.0416	-3.509	0.0005
OTHMIN	-0.0657	0.0670	-0.979	0.3274
<b>Enlistee Age</b>				
AGE	0.0239	0.0070	3.423	0.0006
<b>Family Status</b>				
Single Parent Household (SPHH)	0.0182	0.0270	0.673	0.5009

\*To correctly interpret the effects of each of the variables on rifle score multiply the parameter estimates by ten.

Source: Derived from data provided by the Defense Manpower Data Center.

**Table 4.21. Results of Ordinary Least Squares (OLS) Marine Corps  
Physical Fitness Test Score (PFT\_SCOR) Model**

<b>INDEPENDENT VARIABLE</b>	<b>Parameter Estimate</b>	<b>Standard Error</b>	<b>T for HO: Para = 0</b>	<b>Prob &gt; T</b>
<b>Parents Highest SES Index</b>				
PSEI	-0.0010	0.0220	-0.045	0.6507
PSEI_NV	-0.1804	1.2602	-0.143	0.8862
<b>Parents Highest Education</b>				
P_NHSD	1.2987	1.0640	1.221	0.2223
P_SCOLL	0.0645	0.8189	0.079	0.9372
P_COLL	2.2939	0.9529	2.407	0.0161
<b>Home Ownership</b>				
OWN	-0.7808	0.8004	-0.975	0.3294
NOPAY	-0.4466	1.8450	-0.842	0.8087
<b>Census District</b>				
NC_DIST	-1.9760	1.1307	-1.748	0.0806
S_DIST	-3.3166	1.1442	-2.977	0.0029
W_DIST	2.1231	1.2052	1.762	0.0782
<b>Race/Ethnicity</b>				
BLACK	6.2352	0.9460	6.591	0.0001
HISPAN	4.6533	1.1663	3.990	0.0001
OTHMIN	2.7500	1.9606	1.403	0.1608
<b>Enlistee Age</b>				
AGE	-0.2771	0.1883	-1.472	0.1411
<b>Family Status</b>				
Single Parent Household (SPHH)	0.0057	0.7569	0.008	0.9940

Source: Derived from data provided by the Defense Manpower Data Center.

## 2. "Typical" Cases

To better understand the relationships in these models, three "typical" cases are presented to explain the relationship between SES indicators and performance as measured by rifle marksmanship and PFT scores.<sup>84</sup> Table 4.22 illustrates the differences in rifle marksmanship and PFT scores for changes based on each of these three cases.

**Table 4.22. Comparison of Marginal Effects Analysis for Physical Fitness Test Scores (PFT\_SCOR) and Rifle Marksmanship Scores (R\_SCORE) using Three "Typical" Marine Corps Recruit's<sup>a</sup> SES Backgrounds**

	Case 1 (NHSD) <sup>c</sup>	$\Delta^b$	Case 2 (HSD) <sup>c</sup>	$\Delta^b$	Case 3 (College Grad) <sup>c</sup>
PFT_SCOR	-4.58	-1.5	-6.08	+2.02	-4.06
R_SCORE	0.30	-0.03	0.27	+1.10	0.37

<sup>a</sup> Includes non-prior service, active-duty enlisted accessions from 1989 to 1991.

<sup>b</sup> Delta ( $\Delta$ ) represents the differences in PFT and rifle marksmanship scores between Case 1 and Case 3 as compared with Case 2.

<sup>c</sup> These represent the parents' highest level of education in a recruit's household. NHSD, HSD, and ColGrad stand for non-high school diploma, high school diploma and college graduate, respectively.

Source: Derived from data provided by the Defense Manpower Data Center.

As seen in Table 4.22, the differences between these cases are relatively small for both PFT and rifle marksmanship scores. Although the variables for PSEI and home ownership and parents with a college degree are statistically significant when examining the relationships between SES and rifle marksmanship and PFT scores, respectively, these effects are negligible.

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<sup>84</sup> "Typical" cases are defined the same way as they were for first-term enlisted attrition in this study.





## **V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

### **A. SUMMARY**

This thesis attempts to answer two questions. First, what is the socioeconomic status of Army and Marine Corps recruits in comparison with that of the general population? And, second, what is the relationship between a recruit's socioeconomic background and his or her performance? After reviewing previous research and creating a database that encompasses demographic, SES, and performance-based data, the authors use cross tabulation analysis and linear and logit multivariate models to determine SES representation and the relationship between SES and performance.

### **B. CONCLUSIONS**

Clearly, the comment made by Lord Wellesley, Duke of Wellington, in 1813--that common soldiers are "the scum of the earth"--cannot be applied to U. S. enlisted forces in the 1990s. Successful efforts in all four services to recruit young men and women with a high school diploma and a relatively high score on the AFQT have significantly changed the composition of the rank and file. Recruits in the Army and Marine Corps are of considerable higher quality than the "ill-educated and hapless" or "vagabonds and paupers" who fought to defend the nation's interests during certain earlier periods of American history.

This study suggests that recruits in the Army and Marine Corps come from slightly lower socioeconomic backgrounds than do their 18- to 24-year-old civilian counterparts. While this may not be surprising, in light of previous research that reported

similar differences,<sup>85</sup> the authors also found that most of the disparities in SES can be explained by the fact that soldiers and Marines are significantly underrepresented in the highest quartile and overrepresented in the lowest quartiles of socioeconomic class. This is not to say that these recruits are unrepresented in the very highest levels of the SES distribution. Nevertheless, in comparison with the parents of 18- to 24-year-olds in the general population, the parents of recruits in the Army and Marine Corps are more likely to be non-high school graduates and work in blue collar occupations; and, further, the parents of these recruits are less likely to own homes, earn a college degree, or work as executives or professionals. Analysis of other likely causes of differences in SES representation between the military and general population--such as race/ethnicity, gender, inclusion of officers, family background, reasons for joining, and region-- suggest that each of these factors has little to no effect on SES averages in both services.

Results of the linear and logit multivariate models used in this study indicate that further analysis of the relationship between SES and performance is required. The authors found that SES has small but significant effects on several measures of on-the-job performance in the Marine Corps, but does not explain first-term enlisted attrition in either the Army or Marine Corps. Therefore, the authors conclude that, while SES does predict some aspects of performance in the military, it is a relatively weak predictor of first-term enlisted attrition.

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<sup>85</sup> For example, see Cooper (1977), Fredland and Little (1979), and Fernandez (1989).

## C. RECOMMENDATIONS

Several recommendations for further research can be made as a result of this study. First, the usefulness of the database that was created for this study should be emphasized. The authors have merged data from a relatively untapped resource, the SES survey, with two separate personnel data files maintained by DMDC and the United States Marine Corps. Within the database maintained at the Naval Postgraduate School Computer Center, demographic, SES, personnel loss actions, and performance-based data are available for over 20,000 non-prior service, active-duty enlisted accessions in both the Army and Marine Corps. Continued analyses of the initial cohorts used in this study will allow researchers to track the survey respondents from 1989 to 1995 through the higher enlisted ranks to the end of their careers.

Further, DMDC should continue to merge additional cohorts of SES survey respondents, and both services should add performance variables to the current database. This would allow extended trend analyses of SES representation and the relationship between SES and on-the-job performance. To date, no data on subjective supervisors' evaluations were obtained for either service. With the receipt of additional performance variables, such as subjective supervisors' evaluations, researchers can assess the relationship between SES and "promotability" in the Army and Marine Corps. For example, inclusion of proficiency and conduct marks would provide future studies with a database that is capable of duplicating composite scores for Marines at specific points in time.

This study represents initial exploratory analysis of the relationship between SES and military performance. As performance variables are added to the database, researchers may isolate the effects of SES on all of the measures used to determine promotion in the Army and Marine Corps. Although the primary objective of this study is to examine the relationship between SES and the likelihood of “successful” service in the Army and Marine Corps, isolating possible connections between socioeconomic origins and specific measures of military performance could also have an important effect on future manpower policy and training decisions. For instance, if recruits from lower SES backgrounds have a more difficult time adjusting to life in the armed forces and do not perform as well as higher SES recruits, should the Army and Marine Corps establish remedial programs to help individual soldiers and Marines? What steps, if any, could be taken to ease the transition of these recruits to military life; and what training, if any, can both services provide to assist recruits who may face greater obstacles in career progression because of their SES backgrounds?

## APPENDIX A. DEPARTMENT OF DEFENSE SURVEY OF RECRUITS SOCIOECONOMIC BACKGROUNDS



### Department of Defense

#### SURVEY OF RECRUIT SOCIOECONOMIC BACKGROUNDS

This survey is being conducted to collect information on the socioeconomic backgrounds of new recruits entering military service. The information will become part of the group statistics provided in an annual report to Congress on this subject. The information will be used for research purposes; it will NOT become part of your personnel record and will NOT affect your military career in any way.

Public reporting burden for this collection is estimated to average .166 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

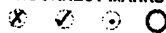
PRIVACY ACT STATEMENT FOR RECRUIT SOCIOECONOMIC SURVEY	
<b>AUTHORITY:</b>	10 USC 136; E.O. 9397.
<b>PRINCIPAL PURPOSE(S):</b>	Information provided on this form will be combined with information from other forms and will be included as group statistics in an annual report to Congress on population representation in the military.  Personal identifiers are used to indicate active or non-active military service status. The survey will be used for analysis of socioeconomic factors in the military community.
<b>ROUTINE USE(S):</b>	None.
<b>DISCLOSURE AND EFFECT(S) ON INDIVIDUAL OF NOT PROVIDING INFORMATION:</b>	Voluntary. Failure to respond to this survey will not result in any unfavorable action to the individual.

■ ■ ■

## INSTRUCTIONS FOR COMPLETING THIS QUESTIONNAIRE

- Use a No. 2 pencil.
- Make heavy black marks that will fill the circle for your answer.

### INCORRECT MARKS



### CORRECT MARK



- If you are asked to "MARK ONE" response, mark the circle beside the single best answer to the question.

**EXAMPLE:** Are you an officer or an enlistee? (MARK ONE)

- ☐ Officer  
☒ Enlistee

- If you are asked to "MARK ALL THAT APPLY," you may mark more than one answer.

**EXAMPLE:** Are you currently: (MARK ALL THAT APPLY)

- ☒ In the Armed Forces  
☐ Working full-time at a non-military job  
☒ Working part-time at a non-military job

- If you are asked to give numbers for your answer,

— Write the numbers in the boxes at the top of the grid, making sure that the last number is in the right-hand box.

— Fill unused boxes with zeroes.

For example, you would write 35 as

0	3	5
---	---	---

— Then, fill in the matching circle under each number.

For example, for 35 you would have:

0	3	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- If you are asked to write in an answer, PLEASE PRINT your answer.

MONTH	DAY	YEAR
<input type="radio"/> January		<input type="radio"/> 1996
<input type="radio"/> February		<input type="radio"/> 1997
<input type="radio"/> March	0 0	
<input type="radio"/> April	1 1	
<input type="radio"/> May	2 2	
<input type="radio"/> June	3 3	
<input type="radio"/> July	4	
<input type="radio"/> August	5	
<input type="radio"/> September	6	
<input type="radio"/> October	7	
<input type="radio"/> November	8	
<input type="radio"/> December	9	

**Army**

- ☐ Fort Benning, GA
- ☐ Fort Jackson, SC
- ☐ Fort Knox, KY
- ☐ Fort Leonard Wood, MO
- ☐ Fort McClellan, AL
- ☐ Fort Sill, OK

**Marine Corps**

- ☐ Parris Island, SC
- ☐ San Diego, CA  
(Marine Recruit Depot)

**Air Force**

- ☐ Lackland AFB, TX

**Navy**

- ☐ Great Lakes, IL

☐ Yes ☐ No

☐ Army National Guard      ☐ Marine Corps Reserve  
☐ Army Reserve      ☐ Regular Marine Corps  
☐ Regular Army      ☐ Air National Guard  
☐ Navy Reserve      ☐ Air Force Reserve  
☐ Regular Navy      ☐ Regular Air Force  
☐ Never served

[illegible]



7. Date of Birth:

MONTH		DAY		YEAR	
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

8. Social Security Number:

0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

9. What race do you consider yourself to be? Are you: (MARK ONE)

- ☐ American Indian or Alaskan Native  
☐ Black  
☐ Asian or Pacific Islander  
☐ White  
☐ Other race

10. Are you? (MARK ONE)

- ☐ Hispanic origin or descent  
☐ Not of Hispanic origin or descent

11. Are you male or female?

- ☐ Male  
☐ Female

12. What is the HIGHEST level of schooling you have COMPLETED? (MARK ONE ONLY)

Elementary

- 1st grade.....☐  
 2nd grade.....☐  
 3rd grade.....☐  
 4th grade.....☐  
 5th grade.....☐  
 6th grade.....☐  
 7th grade.....☐  
 8th grade.....☐

High School

- 9th grade.....☐  
 10th grade.....☐  
 11th grade.....☐  
 12th grade.....☐

College

- 1st year.....☐  
 2nd year.....☐  
 3rd year.....☐  
 4th year.....☐  
 5th year.....☐  
 6th year or more.....☐

13. What type of high school did you attend last as a regular, full-time student? (MARK ONE ONLY)

- ☐ Public school  
☐ Parochial school (such as Catholic or other religious school)  
☐ Private, non-parochial school  
☐ Not applicable - I did not attend any high school.

14. Right before you first signed your enlistment contract and were sworn in, were you working at a paid job or in a business or farm? (MARK ONE)

- ☐ Yes, I was working full-time.  
☐ Yes, I was working part-time.  
☐ No, I was temporarily absent/on layoff from a job or business.  
☐ No, I was without a job and looking for work.  
☐ No, I was not working and not looking for work.

15. Below are some reasons people have for enlisting in the military.  
Please indicate whether each reason is true or not true for you.

I enlisted because . . .	True	Not True
a. I was unemployed and could not find a job . . . . .	<input type="radio"/>	<input type="radio"/>
b. I wanted to give myself a chance to be away from home on my own . . . . .	<input type="radio"/>	<input type="radio"/>
c. The military will give me a chance to better myself in life . . . . .	<input type="radio"/>	<input type="radio"/>
d. I want to travel and live in different places . . . . .	<input type="radio"/>	<input type="radio"/>
e. I want to get away from a personal problem . . . . .	<input type="radio"/>	<input type="radio"/>
f. I want to serve my country . . . . .	<input type="radio"/>	<input type="radio"/>
g. I can earn more money than I could as a civilian . . . . .	<input type="radio"/>	<input type="radio"/>
h. It is a family tradition to serve . . . . .	<input type="radio"/>	<input type="radio"/>
i. I want to prove that I can make it . . . . .	<input type="radio"/>	<input type="radio"/>
j. I want to get trained in a skill that will help me get a civilian job or enhance my job . . . . .	<input type="radio"/>	<input type="radio"/>
k. I want the retirement or fringe benefits . . . . .	<input type="radio"/>	<input type="radio"/>
l. I can get money for a college education . . . . .	<input type="radio"/>	<input type="radio"/>
m. I want additional income . . . . .	<input type="radio"/>	<input type="radio"/>
n. I want to develop leadership skills . . . . .	<input type="radio"/>	<input type="radio"/>

16. Which one of the reasons in Question 15 was your most important reason for enlisting in the military?

(A) (B) (C) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N)

17. In what month and year did you last live with your parent(s), step-parent(s), or guardian(s)?

MONTH	YEAR
<input type="radio"/> January	19 <input type="text"/>
<input type="radio"/> February	<input type="text"/>
<input type="radio"/> March	<input type="text"/>
<input type="radio"/> April	<input type="text"/>
<input type="radio"/> May	<input type="text"/>
<input type="radio"/> June	<input type="text"/>
<input type="radio"/> July	<input type="text"/>
<input type="radio"/> August	<input type="text"/>
<input type="radio"/> September	<input type="text"/>
<input type="radio"/> October	<input type="text"/>
<input type="radio"/> November	<input type="text"/>
<input type="radio"/> December	<input type="text"/>

18. What was the address of the household in which you last lived with your parent(s), step-parent(s), or guardian(s)?

Street Address	
City or Town	State

What is the ZIP Code at that address? →

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

19. Did your parent(s), step-parent(s), or guardian(s) own or rent the residence in Question 18 when you lived there last? (MARK ONE)

- ☐ Owned or were buying it (for example, with a mortgage)  
☐ Rented it  
☐ Occupied it without payment of rent

20. Which of these people were in your household when you last lived there with your parent(s), step-parent(s), or guardian(s) at the address in Question 18? (MARK ALL THAT APPLY)

- ☐ Father  
☐ Stepfather  
☐ Male guardian

IF YOU MARKED ONE OF THESE,  
please complete SECTION A on pages 6-8.

- ☐ Mother  
☐ Stepmother  
☐ Female guardian

IF YOU MARKED ONE OF THESE,  
please complete SECTION B on pages 9-11.

NOTE: If you marked one in each set, you will complete BOTH Section A and Section B.



## SECTION A

- Answer the questions in Section A for the adult male you marked in Question 20.
- If no adult male is marked in Question 20, GO TO SECTION B.

21. What is the HIGHEST level of schooling your father (stepfather) (male guardian) COMPLETED? (MARK ONE)

- ☐ Less than 4 years of high school
- ☐ 4 years of high school
- ☐ Some college, but less than 4 years
- ☐ 4 years of college
- ☐ More than 4 years of college

22. Did your father (stepfather) (male guardian) have any vocational/technical training after high school?

- ☐ Yes
- ☐ No

23. How old is your father (stepfather) (male guardian)? (IF YOU ARE NOT SURE, BUT THINK YOU KNOW HIS AGE WITHIN ONE YEAR, PUT DOWN YOUR BEST GUESS.)

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Age in years

☐ Don't know

☐ No longer living

GO TO QUESTION 28

24. Is your father (stepfather) (male guardian): (MARK ONE CIRCLE)

- ☐ American Indian/Alaskan Native
- ☐ Black/Negro/African-American
- ☐ Oriental/Asian/Chinese/Japanese/Korean/Filipino/Pacific Islander
- ☐ White/Caucasian
- ☐ Other (Specify in the box below)

25. Is your father (stepfather) (male guardian) of Spanish/Hispanic origin or descent? (MARK ONE)

- ☐ Yes
- ☐ No

26. Is your father (stepfather) (male guardian) currently: (MARK ONE)

- ☐ Married
- ☐ Divorced
- ☐ Legally separated
- ☐ Widowed
- ☐ Single, never married

27. Is your father (stepfather) (male guardian) currently retired from a job or occupation? (MARK ONE)

- ☐ Yes
- ☐ No

28. What is the most recent month and year your father (stepfather) (male guardian) worked at a paid job or in a business or farm? (IF HE IS CURRENTLY WORKING, WRITE THE CURRENT MONTH AND YEAR.)

☐ Don't know

MONTH	YEAR
<input type="radio"/> Jan. <input type="radio"/> Feb. <input type="radio"/> Mar. <input type="radio"/> Apr. <input type="radio"/> May <input type="radio"/> Jun. <input type="radio"/> Jul. <input type="radio"/> Aug. <input type="radio"/> Sep. <input type="radio"/> Oct. <input type="radio"/> Nov. <input type="radio"/> Dec.	<div style="display: inline-block; border: 1px solid black; padding: 2px;">19</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-left: 5px;">00</div>

29. Is your father (stepfather) (male guardian) currently working at a paid job or in a business or farm? (MARK ONE ONLY)

☐ Yes, he is currently working.

IN QUESTIONS 30-35, DESCRIBE HIS CURRENT JOB. IF HE HAS MORE THAN ONE JOB, DESCRIBE THE ONE AT WHICH HE WORKS THE MOST HOURS.

☐ No, he is temporarily absent/on layoff from a job or business.

IN QUESTIONS 30-35, DESCRIBE THE JOB FROM WHICH HE IS TEMPORARILY ABSENT OR ON LAYOFF.

☐ No, he is without a job and looking for work.

IN QUESTIONS 30-35, DESCRIBE THE LAST FULL-TIME JOB HE HAD FOR TWO WEEKS OR MORE.

☐ No, he is not working now and not looking for work.

IN QUESTIONS 30-35, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB HE HELD.

☐ No, he is no longer living.

IN QUESTIONS 30-35, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB HE HELD.

☐ No, he has never worked for pay.

GO TO SECTION B

☐ Don't know

<p><b>30. For whom does (did) your father (stepfather) (male guardian) work?</b> (Name of company, business organization, or other employer)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>31. What kind of business or industry is (was) this?</b> (For example: Hospital, newspaper publishing, mail order house, auto engine manufacturing, breakfast cereal manufacturing)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>32. What kind of work is (was) he doing – what is his job called?</b> (For example: Doctor, personnel manager, supervisor of order department, gasoline engine assembler, grinder operator)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>33. What are (were) your father's (stepfather's) (male guardian's) most important activities or duties at this job?</b> (For example: Patient care, directing hiring policies, supervising order clerks, assembling engines, operating grinding mill)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>

<p><b>FOR OFFICE USE ONLY</b></p>	<table border="1"> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> <tr><td>2</td><td>2</td><td>2</td></tr> <tr><td>3</td><td>3</td><td>3</td></tr> <tr><td>4</td><td>4</td><td>4</td></tr> <tr><td>5</td><td>5</td><td>5</td></tr> <tr><td>6</td><td>6</td><td>6</td></tr> <tr><td>7</td><td>7</td><td>7</td></tr> <tr><td>8</td><td>8</td><td>8</td></tr> <tr><td>9</td><td>9</td><td>9</td></tr> </table>	0	0	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	<table border="1"> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>2</td><td>2</td><td>2</td><td>2</td></tr> <tr><td>3</td><td>3</td><td>3</td><td>3</td></tr> <tr><td>4</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>5</td><td>5</td><td>5</td><td>5</td></tr> <tr><td>6</td><td>6</td><td>6</td><td>6</td></tr> <tr><td>7</td><td>7</td><td>7</td><td>7</td></tr> <tr><td>8</td><td>8</td><td>8</td><td>8</td></tr> <tr><td>9</td><td>9</td><td>9</td><td>9</td></tr> </table>	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9
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34. Which of the categories below comes closest to describing his job?

(READ ENTIRE LIST, THEN MARK ONE)

- ☐ CLERICAL OR ADMINISTRATIVE SUPPORT (secretary, bookkeeper, mail-room supervisor, mail clerk, keypunch operator, bank teller, etc.)
- ☐ CONSTRUCTION, MINING, OR DRILLING (skilled construction worker such as carpenter, plumber supervisor, roofer; also miner, well driller, etc.)
- ☐ CRAFT OR PRECISION PRODUCTION (tool-and-die maker, cabinet maker, engraving supervisor, printer, gem cutter, etc.)
- ☐ EXECUTIVE, ADMINISTRATIVE, OR MANAGERIAL (company executive, personnel manager, accountant, school principal, public official, etc.)
- ☐ FARMING, FORESTRY, OR FISHING (farm owner, farmworker, field supervisor, gardener, logger; fisherman, etc.)
- ☐ LABORER, HELPER, HANDLER, EQUIPMENT CLEANER (unskilled construction worker, dock worker, machinist helper, stock handler, car washer, etc.)
- ☐ MACHINE OPERATOR, ASSEMBLER, OR INSPECTOR (punch press operator, sewing machine operator, mill supervisor, furniture assembler, meat inspector, etc.)
- ☐ MECHANIC OR REPAIRER (automobile or aircraft mechanic, maintenance supervisor, television repairer, locksmith, etc.)
- ☐ MILITARY SERVICE in the Active Duty Army, Navy, Air Force, or Marine Corps.
- ☐ PROFESSIONAL (doctor, registered nurse, lawyer, engineer, scientist, teacher, social worker, etc.)
- ☐ PROTECTIVE SERVICE (police officer, firefighter, security guard, etc.)
- ☐ SALES (real estate or insurance agent, sales clerk, retail store manager, automobile salesman, etc.)
- ☐ SERVICE OCCUPATION (waiter, cook, beautician, housekeeper, janitor supervisor, child care worker, hospital orderly, etc.)
- ☐ TECHNICIAN (computer programmer, dental hygienist, licensed practical nurse, laboratory technician, air traffic controller, etc.)
- ☐ TRANSPORTATION OR MATERIAL MOVING (truck or bus driver, railroad conductor, barge captain, bulldozer operator, etc.)
- ☐ DON'T KNOW
- ☐ NEVER WORKED

35. Is (was) your father (stepfather) (male guardian) — (MARK ONE)

- ☐ Employee of private company, business, or individual for wages, salary, or commissions
- ☐ Federal government employee
- ☐ State government employee
- ☐ Local government employee (city, county, town employee, etc.)
- ☐ Self-employed in own business, professional practice, or farm
- ☐ Working without pay in family business or farm
- ☐ Don't know

END OF SECTION A



## SECTION B

- Answer the questions in Section B for the adult female you marked in Question 20.
- If no adult female is marked in Question 20, your questionnaire is now complete. Thank you for participating.

36. What is the HIGHEST level of schooling your mother (stepmother) (female guardian) COMPLETED? (MARK ONE)

- ☐ Less than 4 years of high school  
☐ 4 years of high school  
☐ Some college, but less than 4 years  
☐ 4 years of college  
☐ More than 4 years of college

37. Did your mother (stepmother) (female guardian) have any vocational/technical training after high school?

- ☐ Yes    ☐ No

38. How old is your mother (stepmother) (female guardian)? (IF YOU ARE NOT SURE, BUT THINK YOU KNOW HER AGE WITHIN ONE YEAR, PUT DOWN YOUR BEST GUESS.)

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Age in years

☐ Don't know

☐ No longer living

**GO TO QUESTION 43**

39. Is your mother (stepmother) (female guardian): (MARK ONE CIRCLE)

- ☐ American Indian/Alaskan Native  
☐ Black/Negro/African-American  
☐ Oriental/Asian/Chinese/Japanese/  
     Korean/Filipino/Pacific Islander  
☐ White/Caucasian  
☐ Other (Specify in the box below)

40. Is your mother (stepmother) (female guardian) of Spanish/Hispanic origin or descent? (MARK ONE)

- ☐ Yes    ☐ No

41. Is your mother (stepmother) (female guardian) currently: (MARK ONE)

- ☐ Married                      ☐ Widowed  
☐ Divorced                    ☐ Single, never married  
☐ Legally separated

42. Is your mother (stepmother) (female guardian) currently retired from a job or occupation? (MARK ONE)

- ☐ Yes    ☐ No

43. What is the most recent month and year your mother (stepmother) (female guardian) worked at a paid job or in a business or farm? (IF SHE IS CURRENTLY WORKING, WRITE THE CURRENT MONTH AND YEAR.)

☐ Don't know

MONTH	YEAR																						
<input type="radio"/> Jan. <input type="radio"/> Feb. <input type="radio"/> Mar. <input type="radio"/> Apr. <input type="radio"/> May <input type="radio"/> Jun. <input type="radio"/> Jul. <input type="radio"/> Aug. <input type="radio"/> Sep. <input type="radio"/> Oct. <input type="radio"/> Nov. <input type="radio"/> Dec.	19 <table border="1" style="border-collapse: collapse; display: inline-table;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;">3</td></tr> <tr><td style="text-align: center;">4</td><td style="text-align: center;">4</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">5</td></tr> <tr><td style="text-align: center;">6</td><td style="text-align: center;">6</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">7</td></tr> <tr><td style="text-align: center;">8</td><td style="text-align: center;">8</td></tr> <tr><td style="text-align: center;">9</td><td style="text-align: center;">9</td></tr> </table>			0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
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7	7																						
8	8																						
9	9																						

44. Is your mother (stepmother) (female guardian) currently working at a paid job or in a business or farm? (MARK ONE ONLY)

Yes, she is currently working..... ☐

IN QUESTIONS 45-50, DESCRIBE HER CURRENT JOB. IF SHE HAS MORE THAN ONE JOB, DESCRIBE THE ONE AT WHICH SHE WORKS THE MOST HOURS.

No, she is temporarily absent/on layoff from a job or business..... ☐

IN QUESTIONS 45-50, DESCRIBE THE JOB FROM WHICH SHE IS TEMPORARILY ABSENT OR ON LAYOFF.

No, she is without a job and looking for work.... ☐

IN QUESTIONS 45-50, DESCRIBE THE LAST FULL-TIME JOB SHE HAD FOR TWO WEEKS OR MORE.

No, she is not working now and not looking for work..... ☐

IN QUESTIONS 46-50, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB SHE HELD.

No, she is no longer living..... ☐

IN QUESTIONS 48-50, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB SHE HELD.

No, she has never worked for pay..... ☐

IF SHE HAS NEVER WORKED FOR PAY, YOUR QUESTIONNAIRE IS NOW COMPLETE.

Don't know..... ☐

<p><b>45. For whom does (did) your mother (stepmother) (female guardian) work? (Name of company, business organization, or other employer)</b></p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>46. What kind of business or industry is (was) this?</b> (For example: Hospital, newspaper publishing, mail order house, auto engine manufacturing, breakfast cereal manufacturing)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>47. What kind of work is (was) she doing – what is her job called?</b> (For example: Doctor, personnel manager, supervisor of order department, gasoline engine assembler, grinder operator)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>
<p><b>48. What are (were) your mother's (stepmother's) (female guardian's) most important activities or duties at this job?</b> (For example: Patient care, directing hiring policies, supervising order clerks, assembling engines, operating grinding mill)</p> <p>_____</p> <p>Please print _____</p> <p>_____</p> <p>_____</p>	<p>Don't know <input type="radio"/></p>

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49. Which of the categories below comes closest to describing her job?

(READ ENTIRE LIST, THEN MARK ONE)

- ☐ CLERICAL OR ADMINISTRATIVE SUPPORT (secretary, bookkeeper, mail-room supervisor, mail clerk, keypunch operator, bank teller, etc.)
- ☐ CONSTRUCTION, MINING, OR DRILLING (skilled construction worker such as carpenter, plumber supervisor, roofer; also miner, well driller, etc.)
- ☐ CRAFT OR PRECISION PRODUCTION (tool-and-die maker, cabinet maker, engraving supervisor, printer, gem cutter, etc.)
- ☐ EXECUTIVE, ADMINISTRATIVE, OR MANAGERIAL (company executive, personnel manager, accountant, school principal, public official, etc.)
- ☐ FARMING, FORESTRY, OR FISHING (farm owner, farmworker, field supervisor, gardener, logger; fisherman, etc.)
- ☐ LABORER, HELPER, HANDLER, EQUIPMENT CLEANER (unskilled construction worker, dock worker, machinist helper, stock handler, car washer, etc.)
- ☐ MACHINE OPERATOR, ASSEMBLER, OR INSPECTOR (punch press operator, sewing machine operator, mill supervisor, furniture assembler, meat inspector, etc.)
- ☐ MECHANIC OR REPAIRER (automobile or aircraft mechanic, maintenance supervisor, television repairer, locksmith, etc.)
- ☐ MILITARY SERVICE in the Active Duty Army, Navy, Air Force, or Marine Corps.
- ☐ PROFESSIONAL (doctor, registered nurse, lawyer, engineer, scientist, teacher, social worker, etc.)
- ☐ PROTECTIVE SERVICE (police officer, firefighter, security guard, etc.)
- ☐ SALES (real estate or insurance agent, sales clerk, retail store manager, automobile salesman, etc.)
- ☐ SERVICE OCCUPATION (waitress, cook, beautician, housekeeper, janitor supervisor, child care worker, hospital orderly, etc.)
- ☐ TECHNICIAN (computer programmer, dental hygienist, licensed practical nurse, laboratory technician, air traffic controller, etc.)
- ☐ TRANSPORTATION OR MATERIAL MOVING (truck or bus driver, railroad conductor, barge captain, bulldozer operator, etc.)
- ☐ DON'T KNOW
- ☐ NEVER WORKED

50. Is (was) your mother (stepmother) (female guardian) — (MARK ONE)

- ☐ Employee of private company, business, or individual for wages, salary, or commissions
- ☐ Federal government employee
- ☐ State government employee
- ☐ Local government employee (city, county, town employee, etc.)
- ☐ Self-employed in own business, professional practice, or farm
- ☐ Working without pay in family business or farm
- ☐ Don't know

END OF SECTION B

THANK YOU FOR YOUR COOPERATION IN THIS SURVEY





**APPENDIX B. ARMY "WISHLIST" FOR ADDITIONAL, SERVICE-  
PROVIDED PERFORMANCE MEASURES**

1. Evaluations—scores.
2. SQT Scores.
3. Education and Training—performance scores and class ranking in AIT or other occupational training; college credit and GPA, if available.
4. Awards—type and number.
5. Physical Fitness—scores or pass/fail.
6. Weapons Qualification Scores.
7. Alcohol, Drug Abuse Problems—yes/no.
8. Family Advocacy Problems—yes/no.
9. Other Problems While in Service—NJP (Article 15), court-martial, letters of reprimand, security incidents, etc.



**APPENDIX C. MARINE CORPS "WISHLIST" FOR ADDITIONAL,  
SERVICE-PROVIDED PERFORMANCE MEASURES**

1. Evaluations—E-1 to E-4 (proficiency conduct marks); E-5+ (fitness report scores).
2. Marine Battle Skill Test Scores.
3. Education and Training—performance scores and class ranking in primary MOS schools; college credit and GPA, if available.
4. Awards—type and number.
5. Physical Fitness—scores or pass/fail.
6. Weapons Qualification Scores.
7. Swim Qualification Scores.
8. Alcohol, Drug Abuse Problems—yes/no.
9. Family Advocacy Problems—yes/no.
10. Other Legal Problems—NJP (Article 15), court-martial, letters of reprimand, security incidents, etc.



# **APPENDIX D.      ORDINARY LEAST SQUARES (OLS) REGRESSION RESULTS FOR ARMED FORCES QUALIFICATION TEST (AFQT)**

The tables shown below are part of the actual SAS output listings.

**TABLE D-1 -- ARMY AFQT OLS RESULTS**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	796388.60776	53092.57385	180.974	0.0001
Error	14868	4361854.8932	293.37199981		
C Total	14883	5158243.5009			
Root MSE	17.12811	R-square	0.1544		
Dep Mean	60.08694	Adj R-sq	0.1535		
C.V.	28.50554				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	50.144911	1.20304172	41.682	0.0001
PSEI	1	0.143740	0.00954675	15.056	0.0001
PSEI_NV	1	-0.421805	0.54994426	-0.767	0.4431
P_NHSD	1	-0.478117	0.47310936	-1.011	0.3122
P_SCOLL	1	3.947852	0.35942303	10.984	0.0001
P_COLL	1	4.361021	0.42577277	10.243	0.0001
OWN	1	1.287787	0.34611856	3.721	0.0002
NO PAY	1	-1.445437	0.72716336	-1.988	0.0469
S_DIST	1	-1.313558	0.42648673	-3.080	0.0021
NC_DIST	1	-1.203299	0.46414162	-2.593	0.0095
W_DIST	1	-0.973156	0.49182399	-1.979	0.0479
BLACK	1	-12.977889	0.38947253	-33.322	0.0001
HISPAN	1	-6.471654	0.62344361	-10.380	0.0001
OTHMIN	1	-4.628229	0.80360515	-5.759	0.0001
AGE	1	0.289710	0.05431908	5.333	0.0001
SPHH	1	1.729874	0.33041483	5.235	0.0001

**TABLE D-2 -- MARINE CORPS AFQT OLS RESULTS**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	571158.67232	38077.24482	135.585	0.0001
Error	15413	4328551.9745	280.83773273		
C Total	15428	4899710.6468			

Root MSE	16.75821	R-square	0.1166
Dep Mean	59.51727	Adj R-sq	0.1157
C.V.	28.15689		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	45.976326	1.63922882	28.048	0.0001
PSEI	1	0.128812	0.00909749	14.159	0.0001
PSEI_NV	1	-0.907723	0.53281124	-1.704	0.0885
P_NHSD	1	-0.451334	0.44882020	-1.006	0.3146
P_SCOLL	1	3.739354	0.34831668	10.736	0.0001
P_COLL	1	4.205539	0.39763169	10.576	0.0001
OWN	1	0.237763	0.33329502	0.713	0.4756
NOPAY	1	-2.938968	0.72121912	-4.075	0.0001
S_DIST	1	0.567545	0.41438370	1.370	0.1708
NC_DIST	1	0.333319	0.43581610	0.765	0.4444
W_DIST	1	1.037143	0.45246453	2.292	0.0219
BLACK	1	-10.744727	0.41700265	-25.767	0.0001
HISPAN	1	-6.622983	0.49583203	-13.357	0.0001
OTHMIN	1	-4.302295	0.75676641	-5.685	0.0001
AGE	1	0.448265	0.08176948	5.482	0.0001
SPHH	1	2.021771	0.31630382	6.392	0.0001

## APPENDIX E. FIRST-TERM ATTRITION LOGIT MODEL RESULTS

The tables shown below are part of the actual SAS output listings.

TABLE E-1 -- ARMY BEHAVIORAL ATTRITION (ATT1) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	8121.203	8086.038	.
SC	8128.085	8196.163	.
-2 LOG L	8119.203	8054.038	65.164 with 15 DF (p=0.0001)
Score	.	.	66.034 with 15 DF (p=0.0001)

### Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-0.9227	0.2362	15.2592	0.0001	.	.
PSEI	1	0.000658	0.00190	0.1205	0.7285	0.007442	1.001
PSEI_NV	1	0.2548	0.1054	5.8434	0.0156	0.043770	1.290
P_NHSD	1	0.0569	0.0864	0.4331	0.5105	0.011041	1.059
P_SCOLL	1	-0.1010	0.0704	2.0617	0.1510	-0.025189	0.904
P_COLL	1	-0.0972	0.0843	1.3280	0.2492	-0.022367	0.907
OWN	1	-0.1664	0.0660	6.3498	0.0117	-0.041477	0.847
NOPAY	1	-0.0640	0.1431	0.1999	0.6548	-0.006978	0.938
NC_DIST	1	-0.00765	0.0899	0.0072	0.9322	-0.001846	0.992
S_DIST	1	0.0235	0.0843	0.0773	0.7809	0.006362	1.024
W_DIST	1	-0.0282	0.0978	0.0829	0.7734	-0.006037	0.972
BLACK	1	0.2310	0.0709	10.6117	0.0011	0.051067	1.260
HISPAN	1	-0.4602	0.1378	11.1546	0.0008	-0.058501	0.631
OTHMIN	1	-0.00676	0.1684	0.0016	0.9680	-0.000615	0.993
AGE	1	-0.00574	0.0108	0.2820	0.5954	-0.008094	0.994
SPHH	1	0.0690	0.0636	1.1757	0.2782	0.017514	1.071

TABLE E-2 -- ARMY NON-BEHAVIORAL ATTRITION (ATT2) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	5421.566	5394.162	.
SC	5428.448	5504.287	.
-2 LOG L	5419.566	5362.162	57.404 with 15 DF (p=0.0001)
Score	.	.	58.157 with 15 DF (p=0.0001)

### Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.3171	0.2849	135.5272	0.0001	.	.
PSEI	1	0.00282	0.00243	1.3465	0.2459	0.031894	1.003
PSEI_NV	1	0.1766	0.1434	1.5162	0.2182	0.030337	1.193
P_NHSD	1	0.0694	0.1169	0.3529	0.5525	0.013482	1.072



P_COLL	1	0.0762	0.0926	0.6768	0.4107	0.018994	1.079
P_COLL	1	0.0312	0.1097	0.0808	0.7763	0.007175	1.032
OWN	1	0.0672	0.0902	0.5549	0.4563	0.016756	1.070
NOPAY	1	-0.2631	0.2137	1.5166	0.2181	-0.028698	0.769
NC_DIST	1	0.0459	0.1176	0.1525	0.6962	0.011084	1.047
S_DIST	1	0.0896	0.1108	0.6543	0.4186	0.024302	1.094
W_DIST	1	-0.0725	0.1284	0.3190	0.5722	-0.015541	0.930
BLACK	1	-0.4707	0.1055	19.9152	0.0001	-0.104075	0.625
HISPAN	1	-0.3686	0.1773	4.3249	0.0376	-0.046863	0.692
OTHMIN	1	0.0726	0.2077	0.1221	0.7268	0.006606	1.075
AGE	1	0.0612	0.0125	24.1285	0.0001	0.086281	1.063
SPHH	1	0.1084	0.0843	1.6563	0.1981	0.027524	1.115

Association of Predicted Probabilities and Observed Responses

Concordant = 56.8%	Somers' D = 0.158
Discordant = 41.0%	Gamma = 0.162
Tied = 2.2%	Tau-a = 0.035
(5665482 pairs)	c = 0.579

TABLE E-3 -- ARMY OVERALL ATTRITION (ATT3) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	9541.214	9511.310	.
SC	9548.097	9621.435	.
-2 LOG L	9539.214	9479.310	59.903 with 15 DF (p=0.0001)
Score	.	.	59.364 with 15 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-1.0707	0.2084	26.3864	0.0001	.	.
PSEI	1	0.00190	0.00168	1.2770	0.2585	0.021484	1.002
PSEI_NV	1	0.2954	0.0964	9.3869	0.0022	0.050739	1.344
P_NHSD	1	0.0778	0.0787	0.9790	0.3224	0.015110	1.081
P_COLL	1	-0.0464	0.0629	0.5447	0.4605	-0.011573	0.955
P_COLL	1	-0.0646	0.0751	0.7414	0.3892	-0.014873	0.937
OWN	1	-0.1060	0.0600	3.1151	0.0776	-0.026421	0.899
NOPAY	1	-0.1630	0.1318	1.5293	0.2162	-0.017774	0.850
NC_DIST	1	0.0165	0.0803	0.0424	0.8368	0.003992	1.017
S_DIST	1	0.0626	0.0755	0.6866	0.4073	0.016977	1.065
W_DIST	1	-0.0555	0.0871	0.4063	0.5239	-0.011904	0.946
BLACK	1	-0.00492	0.0655	0.0056	0.9401	-0.001088	0.995
HISPAN	1	-0.5250	0.1187	19.5539	0.0001	-0.066741	0.592
OTHMIN	1	0.0308	0.1491	0.0426	0.8364	0.002802	1.031
AGE	1	0.0275	0.00947	8.4516	0.0036	0.038813	1.028
SPHH	1	0.1073	0.0573	3.5027	0.0613	0.027234	1.113

Association of Predicted Probabilities and Observed Responses

Concordant = 54.7%	Somers' D = 0.111
Discordant = 43.6%	Gamma = 0.113
Tied = 1.6%	Tau-a = 0.052
(12179706 pairs)	c = 0.556

TABLE E-4 -- MARINE CORPS BEHAVIORAL ATTRITION (ATT1) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	7655.659	7654.180	.
SC	7662.633	7765.776	.
-2 LOG L	7653.659	7622.180	31.479 with 15 DF (p=0.0076)
Score	.	.	32.022 with 15 DF (p=0.0064)

## Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-1.6906	0.3417	24.4715	0.0001	.	.
PSEI	1	-0.00035	0.00199	0.0309	0.8604	-0.003901	1.000
PSEI_NV	1	0.1514	0.1092	1.9233	0.1655	0.027047	1.163
P_NHSD	1	0.1274	0.0914	1.9437	0.1633	0.024461	1.136
P_SCOLL	1	-0.0540	0.0744	0.5256	0.4685	-0.013212	0.947
P_COLL	1	-0.0754	0.0864	0.7611	0.3830	-0.017220	0.927
OWN	1	-0.1026	0.0705	2.1140	0.1460	-0.025366	0.903
NOPAY	1	-0.0706	0.1600	0.1950	0.6588	-0.007360	0.932
NC_DIST	1	0.0552	0.0909	0.3680	0.5441	0.013731	1.057
S_DIST	1	-0.0336	0.0900	0.1391	0.7092	-0.008712	0.967
W_DIST	1	0.0929	0.0971	0.9172	0.3382	0.021486	1.097
BLACK	1	0.2053	0.0823	6.2278	0.0126	0.040498	1.228
HISPAN	1	-0.3005	0.1149	6.8448	0.0089	-0.047601	0.740
OTHMIN	1	-0.00459	0.1641	0.0008	0.9777	-0.000449	0.995
AGE	1	0.0147	0.0168	0.7571	0.3842	0.013697	1.015
SPHH	1	-0.00397	0.0673	0.0035	0.9530	-0.001002	0.996

TABLE E-5 -- MARINE CORPS NON-BEHAVIORAL ATTRITION (ATT2) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	7346.294	7301.032	.
SC	7353.269	7412.628	.
-2 LOG L	7344.294	7269.032	75.263 with 15 DF (p=0.0001)
Score	.	.	71.932 with 15 DF (p=0.0001)

## Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.7260	0.3338	66.6966	0.0001	.	.
PSEI	1	-0.00108	0.00203	0.2848	0.5936	-0.012053	0.999
PSEI_NV	1	0.00649	0.1162	0.0031	0.9555	0.001159	1.007
P_NHSD	1	0.0277	0.0981	0.0796	0.7778	0.005314	1.028
P_SCOLL	1	0.00263	0.0766	0.0012	0.9726	0.000644	1.003
P_COLL	1	0.0553	0.0873	0.4008	0.5267	0.012624	1.057
OWN	1	0.0677	0.0755	0.8031	0.3702	0.016745	1.070
NOPAY	1	0.1611	0.1636	0.9703	0.3246	0.016788	1.175

NC_DIST	1	-0.1361	0.0899	2.2942	0.1299	-0.033871	0.873
S_DIST	1	-0.1091	0.0880	1.5383	0.2149	-0.028308	0.897
W_DIST	1	-0.3948	0.1010	15.2651	0.0001	-0.091263	0.674
BLACK	1	-0.00382	0.0864	0.0019	0.9648	-0.000753	0.996
HISPAN	1	-0.5552	0.1316	17.7983	0.0001	-0.087938	0.574
OTHMIN	1	-0.4155	0.1973	4.4345	0.0352	-0.040643	0.660
AGE	1	0.0709	0.0163	18.9233	0.0001	0.066278	1.074
SPHH	1	-0.00758	0.0701	0.0117	0.9139	-0.001915	0.992

TABLE E-6 -- MARINE CORPS OVERALL ATTRITION (ATT3) LOGIT MODEL RESULTS

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	10366.518	10315.958	.
SC	10373.492	10427.554	.
-2 LOG L	10364.518	10283.958	80.559 with 15 DF (p=0.0001)
Score	.	.	79.211 with 15 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-1.4913	0.2774	28.9028	0.0001	.	.
PSEI	1	-0.00089	0.00161	0.3038	0.5815	-0.009883	0.999
PSEI_NV	1	0.1105	0.0911	1.4716	0.2251	0.019738	1.117
P_NHSD	1	0.1056	0.0765	1.9063	0.1674	0.020265	1.111
P_SCOLL	1	-0.0345	0.0605	0.3240	0.5692	-0.008436	0.966
P_COLL	1	-0.0152	0.0697	0.0473	0.8278	-0.003465	0.985
OWN	1	-0.0288	0.0586	0.2419	0.6228	-0.007132	0.972
NOPAY	1	0.0521	0.1307	0.1588	0.6903	0.005428	1.053
NC_DIST	1	-0.0534	0.0733	0.5314	0.4660	-0.013299	0.948
S_DIST	1	-0.0951	0.0721	1.7381	0.1874	-0.024677	0.909
W_DIST	1	-0.1782	0.0792	5.0639	0.0244	-0.041194	0.837
BLACK	1	0.1383	0.0688	4.0447	0.0443	0.027291	1.148
HISPAN	1	-0.5110	0.0945	29.2166	0.0001	-0.080928	0.600
OTHMIN	1	-0.2356	0.1394	2.8537	0.0912	-0.023039	0.790
AGE	1	0.0569	0.0137	17.2862	0.0001	0.053141	1.059
SPHH	1	-0.00716	0.0552	0.0168	0.8969	-0.001808	0.993

# **APPENDIX F. MARINE CORPS WATER SURVIVAL QUALIFICATION AND AWARDS LOGIT MODELS RESULTS**

The tables shown below are part of the actual SAS output listings.

**TABLE F-1 MARINE CORPS WATER SURVIVAL QUALIFICATION LOGIT MODEL RESULTS**

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	26407.009	24620.758	.
SC	26414.929	24747.477	.
-2 LOG L	26405.009	24588.758	1816.251 with 15 DF (p=0.0001)
Score	.	.	1641.152 with 15 DF (p=0.0001)

## Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-1.2322	0.1927	40.8969	0.0001	.	.
PSEI	1	0.00513	0.00102	25.3315	0.0001	0.057954	1.005
PSEI NV	1	0.2140	0.0630	11.5284	0.0007	0.036976	1.239
P_NHSD	1	-0.1064	0.0544	3.8344	0.0502	-0.019883	0.899
P_SCOLL	1	0.2328	0.0394	34.9479	0.0001	0.058029	1.262
P_COLL	1	0.3240	0.0449	52.0762	0.0001	0.075891	1.383
OWN	1	0.0370	0.0389	0.9052	0.3414	0.009159	1.038
NOPAY	1	0.1504	0.0850	3.1302	0.0769	0.015803	1.162
NC_DIST	1	0.8398	0.0585	206.0957	0.0001	0.208442	2.316
S_DIST	1	0.3129	0.0583	28.7928	0.0001	0.083600	1.367
W_DIST	1	1.0547	0.0603	306.3905	0.0001	0.245322	2.871
BLACK	1	-1.5428	0.0651	562.2757	0.0001	-0.291839	0.214
HISPAN	1	-0.1944	0.0545	12.7098	0.0004	-0.032238	0.823
OTHMIN	1	-0.5779	0.0895	41.7323	0.0001	-0.056381	0.561
AGE	1	-0.0104	0.00947	1.2141	0.2705	-0.009488	0.990
SPHH	1	0.1089	0.0364	8.9338	0.0028	0.027312	1.115

**TABLE F-2 MARINE CORPS AWARDS LOGIT MODEL RESULTS**

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	13487.919	13447.441	.
SC	13495.931	13575.628	.
-2 LOG L	13485.919	13415.441	70.478 with 15 DF (p=0.0001)
Score	.	.	71.544 with 15 DF (p=0.0001)

## Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.1531	0.2723	134.1101	0.0001	.	.
PSEI	1	0.000052	0.00161	0.0010	0.9745	0.000580	1.000

PSEI_NV	1	-0.0209	0.0919	0.0519	0.8198	-0.003627	0.979
P_NHSD	1	-0.00690	0.0747	0.0085	0.9264	-0.001299	0.993
P_SCOLL	1	-0.2962	0.0614	23.2424	0.0001	-0.073736	0.744
P_COLL	1	-0.2204	0.0700	9.9181	0.0016	-0.051520	0.802
OWN	1	-0.1156	0.0566	4.1712	0.0411	-0.028741	0.891
NOPAY	1	-0.2095	0.1352	2.4020	0.1212	-0.022070	0.811
NC_DIST	1	0.0199	0.0806	0.0611	0.8047	0.004920	1.020
S_DIST	1	-0.1545	0.0788	3.8494	0.0498	-0.041441	0.857
W_DIST	1	-0.0255	0.0849	0.0900	0.7642	-0.005865	0.975
BLACK	1	0.0738	0.0708	1.0852	0.2975	0.014299	1.077
HISPAN	1	0.1065	0.0818	1.6934	0.1932	0.017547	1.112
OTHMIN	1	0.0565	0.1313	0.1851	0.6671	0.005477	1.058
AGE	1	0.0571	0.0133	18.3561	0.0001	0.051410	1.059
SPHH	1	0.0230	0.0548	0.1761	0.6747	0.005781	1.023

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